



# HAZARDOUS MATERIALS ON SCENE COMMANDER

COMMAND 2B



Emergency  
Training  
Services

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# Introduction

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## Background

Effective as of March 6, 1990, OSHA's "Hazardous Waste Operations and Emergency Response" (29 CFR 1910.120) mandates federal training requirements for all persons expected to respond to a hazardous materials incident. California like many states has a state Occupational Health and Safety Administration with their own regulations which are based on federal regulations. For purposes of determining the actual training requirements OSHA has classified emergency responders into the following five different levels of responsibility: 1) First Responder Awareness Level, 2) First Responder Operations Level, 3) Hazardous Materials Technician, 4) Hazardous Materials Specialist, and 5) On-Scene Incident Commander.

This course has been designed expressly to address the requirements imposed by the federal statute for On-Scene Incident Commanders. The requirements imposed on this particular functional level definitely has major implications for emergency response agencies—non compliance could produce serious ramifications for an organization in terms of liability and negligence of duty. The classification of On-Scene Incident Commander incorporates all personnel who may be expected to assume control of an incident. This would certainly include all Chief Officers, Fire Captains and Acting Captains. Moreover,

this classification also includes any persons having in their official job description any stipulation that they may be required, on occasion, to take command of an emergency incident.

The Federal mandate, codified under 29 CFR 1910.120, requires all potential Incident Commanders to have at least 24 hours of training at the First Responder Operations Level, and in addition to achieving the knowledge and skills listed for First Responders, potential Incident Commanders must also demonstrate competency in the following areas:

- √ Ability in implementing the employer's Incident Command System
- √ Understand the employer's emergency response plan
- √ Know how to implement the local and state emergency response plans and how to activate the Federal Regional Response Team
- √ Know the hazards and risks associated with employees working in specialized chemical protective clothing and understand the importance of documentation procedures
- √ "Incident Commanders" are often referred to as "Scene Managers". Throughout this text, depending on the circumstance, either term may be used to denote the individual with responsibility for incident management.

## **Course Orientation**

### **Basic Design**

This course has been designed to be presented in a combination lecture/application format with heavy emphasis on the participation of the students in guided study-group exercises. These group exercises are intended to reinforce the main points of the text, and also to provide the students with the opportunity to demonstrate competency in using incident command techniques in given simulated incident scenarios.

### **Target Audience**

All emergency personnel who may be expected to assume Command of an incident involving hazardous materials.

**Prerequisites**

Haz/Mat First Responder Course and ICS 220 (Basic Orientation) Course.

**Course Description and Goals**

This course is intended to provide Incident Commanders with the skills and competency necessary to mitigate an emergency incident, initiate remedial action, and ensure the restoration of normal services with a comprehensive resource management approach. The course is also intended for students to be brought to the standard of competency established for On-Scene Incident Commanders by OSHA's Final Rule—29 CFR 1910.120 and NFPA Standard 472. Elements of this course are designed to provide the student with many opportunities to exercise and apply their level of competency through direct application on simulated incident scenarios, and by justifying their actions in a Civil Court setting.

**Student Behavioral Objectives**

On completion of the course, the participants will be able to:

1. Demonstrate competency in making an initial hazard analysis and risk assessment of an incident scene, and in developing the strategy and tactics necessary to mitigate the emergency.
2. Demonstrate competency in establishing and organizing the Incident Command System to effectively manage on-scene resources.
3. Outline the various roles to be played by the local, state, and federal agencies having the responsibility to respond to a hazardous materials incident, and demonstrate how to operate within a Unified Command Structure.
4. Demonstrate competency in establishing site control measures including incident isolation, evacuation, site-entry and incident mitigation.

5. Initiate the remedial actions necessary to restore services to normal, including knowing where to obtain funding and how to select a clean-up contractor.
6. Demonstrate the competency in supervising an incident investigation, documenting the proceedings for credibility and initiating the criminal prosecution process.

### **Evaluation Methods**

1. Participation in guided group exercises containing simulated incident scenarios.
2. Participation in a simulated Civil Court action designed to re-enforce the main points of the course.
3. Completion of the Final Exam with at least 80% accuracy.

### **Major Topics**

1. Hazard Assessment
2. Incident Command System
3. Notification Requirements & Inter-agency Involvement
4. Site Control, Site Entry & Containment Operations
5. Clean-up & Restoration
6. Liability & Risk Management
7. Documentation & Incident Investigation



## **Hazard Recognition**

On completion of this chapter the student will be able to:

1. *Describe* the purpose and importance of this Course.
2. *Cite* the Hazardous materials problems faced by On-Scene Commanders.
3. *List* Response Safety Key Points.
4. *Explain* the Variables of Hazard Assessment Summary and Size-Up.
5. *List* the various resources available to Responders and On-Scene Commanders in Hazmat Recognition.
6. *Identify* various sources of product information such as Material Safety Data Sheets, DOT Shipping Papers, Pesticide Labeling, and Placards & Labels.
7. *Recognize* Containers in Highway Emergencies.
8. *Recognize* Containers in Railroad Emergencies.
9. *Describe* how people may be exposed to Toxic substances, materials and products.

## **Course overview**

Hazardous materials incidents are often incorrectly thought of as a ‘new’ type of call for emergency response personnel. Calls that formally were called vehicle accidents, fires, or medical aid calls are now often being classified as hazardous materials incidents. The people responding to these hazardous materials calls need training to safely perform the various jobs at a hazardous materials incident. This course is designed to bring the student the knowledge necessary to perform at the Scene Manager level of training. The Scene Manager level of training is the training needed by persons who may be the first on the scene of a hazardous materials incident. The Scene Manager is expected to do the following in a safe manner: recognize that a hazard exists, call for help, begin notifications, isolate the area and deny unauthorized entry to the area. Additionally, the Scene Manager will perform hazard assessment, incident command, direct site control and cleanup, as well as document the incident.

In this course we will describe methods to help Scene Manager students recognize the possibility of a hazardous materials release; how to call for help; what notifications to perform; various methods of isolating an area and how to deny unauthorized entry. We will outline how to perform hazard assessment and incident command, how to direct control and cleanup of the incident, and how to document the event.

The remainder of this introduction is dedicated to a brief review of FirstResponder responsibilities.

*A Hazardous material can be:*

Flammable

Poisonous

Corrosive

Reactive

Explosive

Radioactive

Thermally unstable

Infectious

Miscellaneous

*Or Any Combination of These Categories.*

## **Hazardous materials problems**

Hazardous materials are the elements, compounds, or mixtures that makeup the world we live in. Our society demands the usage of hazardous materials to maintain our standard of living. In 1984 there was the potential for First Responders to meet more that 70,000 in organic materials, and more that 5,000,000 organic compounds. There are more than 2,000 pounds of hazardous materials consumed for every person inthe United States each year. There are so many different materials that no person can possibly memorize them. There are many different possible lists of hazardous materials, Cal EPA's "List of Lists", the Proposition 65 List, and the Cal OSHA's "Directors's List of Hazardous Substances".

The official definition of what is a hazardous material comes from Title 49 of the Code of Federal Regulations (CFR 49) which states that *a Hazardous Material is a substance or material that has been determined to pose an unreasonable risk to health, safety, or property when transported in commerce.*

The various situations in which we encounter these hazardous

materials, and the condition in which we find them, has proven to be the center of the problem for First Responders. Even seemingly harmless materials can provide us with unreasonable hazards when encountered in certain situations. For instance, when water is introduced into a very hot structure fire, the steam produced can dissociate into its component parts of oxygen and hydrogen. The oxygen released by this “water-gas” reaction can also combine with carbon present in the fire to form toxic and explosive Carbon Monoxide. Another example of under estimating the hazards of a substance occurred with the chemical methyl isocyanate. Due to its misleading lethal dose fifty (LD50) rating as a poison liquid, methyl isocyanate didn’t make the “Top Five Hundred Most Dangerous Substances” list until an incident occurred in Bhopal, India. The Bhopal incident was a release of methyl isocyanate in vapor form, which killed over 2,000 people and maimed more than 20,000 others. This shows that the situation and conditions surrounding a hazardous substance are just as important as the chemical and physical properties of the substance itself.

### **The need for training**

Although the legislation pertaining to hazardous material issues seems to be changing almost on a daily basis, and the responsibility for “scene management” of a hazardous materials incident varies according to the location or situation found, it will always be the emergency responder who is first involved. It does not matter whether they are fire, law enforcement, EMS or private industry personnel, they will be the first line of defense providing safety to citizens, the environment, and property. This course is designed to provide the training so that first responders will remember to protect that often forgotten resource - **themselves**.

### **Hazardous materials incidents are different from other types of emergencies:**

Hazardous materials incidents are different from the traditional fire, law enforcement, or EMS call. In the traditional call there is a need for swift action, often based on minimal evaluation of the overall situation. This very same swift action that so many emergency personnel have been taught is exactly the wrong action to take at a hazardous materials incident. It is very important that emergency response personnel understand how to protect themselves from the hazards of the materials involved in these incidents. Since the traditional signs warning of the presence of hazardous materials are inadequate.

**Hazardous materials problems are reported as:**

Traffic Accident  
Medical Aid  
Fire  
Etc.

Many hazardous materials loads are not correctly placarded, or labeled. Additionally, the emergency responders are often not initially informed that they are responding to a hazardous materials call. Emergency responders can be dispatched to a traffic accident, a fire, or a medical aid call, and after they arrive they find that the call they were dispatched to was a result of a hazardous material incident. Because of this possibility emergency responders should treat all emergencies they respond to as possible hazardous material incidents. By being prepared to properly handle a hazardous materials incident responders are less likely to become victims.

**Locations that hazardous materials are transported, stored, used, manufactured:**

Home  
Federal Express  
United Parcel Service  
Retail Stores

As we said earlier, in our society it is not possible to stay away from hazardous materials. They are in use everywhere, under the sink in most homes are caustic cleaning materials, parcel delivery services (UPS or Federal Express) carry tons of hazardous materials daily and every community has gas stations for automobiles. We are a chemical dependent society, even if you did not use the chemicals in your neighborhood, the chemicals in transit would pass through.

## Response Safety Key Points

Before entry is made into the exclusionary zone, and before any intervention measures are taken at a hazardous materials spill, Incident Command should first determine what the effects of natural stabilization would be. In other words, what would happen if the spilled material was left undisturbed by the emergency responders? All too often, incorrect actions are taken by emergency responders because they felt that something had to be done. ***A thorough risk assessment must always be made and appropriate decontamination facilities must be established before site entry is attempted.*** This should not only be performed to ensure the safety of personnel but also to determine if the benefits are worth the risks involved.

In a hazardous material incident, you may have to delay attending to the injured in order to save the lives of many others:

### Learn to recognize the outward warning signs of the multiple hazards:

- √ individuals collapsed inside hazardous area
  - √ people running from hazardous area
  - √ evidence of fire indicated by smoke
  - √ a loud roar -- of increasing pitch -- of an operating relief valve
  - √ evidence of a leak indicated by a hissing sound
  - √ an individual vomiting near a spilled material
1. Approach all hazmat incidents from upwind and upgrade, positioning vehicle/apparatus headed away from incident.
  2. Recommendations for determining a safe minimum distance from scene:
    - open areas = 1,000 feet
    - residential = one block
    - light commercial = one block
    - large complexes = 500 feet
    - incident hidden by large building = 500 feet
    - stage arriving units more than 2,500 feet upwind from incident

3. The first operational priority is to isolate the hazard area and deny entry.
4. Staging Areas
  - A safe haven for personnel and equipment allowing scene access, from a safe distance.
  - Locate staging areas outside endangered areas, upwind, upgrade an area's safety by natural or man-made barricades between the incident and the staging area.
5. General safety precautions and do's/don'ts
  - Be cautious, treat materials as hazardous until identified
  - If possible, approach upwind, upgrade, and upstream
  - Keep safe distance until identified risk is confirmed
  - Isolate and deny entry (Limit number of responders)
  - Do not rush to victims without protective equipment
  - Do not touch, ingest, or inhale unknown released material (Do not assume vapor is harmless due to lack of smell)
  - Do not eat, drink, or smoke in the incident area
  - Eliminate all ignition sources (including flares) near incident area
  - Establish and observe safety perimeters/zones
  - Do not worry about looking foolish (Your health and the health of others is at stake) Think safety!

## Summary of Size-Up, Variables of Identification and Hazard Assessment (IDHA)

Size-up is simply an emergency response buzz word for a complete systematic appraisal of the conditions surrounding the incident scene. Your size-up should begin before you even initiate your response, and it should continue on an on-going basis throughout the whole incident. Analyze the facts:

*What day is it? Is it a weekend or working day? What time of day is it? Will the streets be clear, or is it close to rush-hour traffic times? These factors can affect your response time to the incident, or even the actual response route you elect to take. What are the weather conditions? What is the ambient temperature and humidity? Is it raining? What is the speed and direction of the wind?*

These particular factors can have a major impact on the outcome of any hazardous materials incident and therefore, they should have serious consideration in your decision making.

*What history or information did you receive from the reporting party regarding the incident? What hazardous substances are present? What types of containers are involved and have they sustained any damage? Are the products spilled or contained? Are there any chemical fumes or vapor clouds? Are there any flame impingement or fire involvement? Are there any human or animal casualties? Has there been any damage to property or the environment? Are the first arriving units strategically placed, or are they in a position of danger?*

When you actually arrive on the incident scene, you should look at these factors before making any operation decisions. Next, anticipate the probabilities and possibilities regarding the incident.

*What is probably going to happen, and what are the possibilities of something happening? Will there be, or could there be an explosion or fire? What is the potential for loss of life, or damage to property and the environment? What is the possibility of modifying condition, such as the likelihood of rain? What are your immediate concerns, and what should be your primary objectives? What is your situation in terms of your own resources? What additional help will you need?*



There are a great many facts, probabilities, and possibilities to consider. Therefore, these concerns must be addressed in a systematic manner which will require pre-thinking and pre-planning on the part of the emergency responder.

### *Initial Actions to Control the Scene*

- √ Utilize cautionary approach.
- √ Keep nonessential people out of area.
- √ Utilize binoculars to attempt to assess the incident area.
- √ Provide incoming units with a condition report prior to taking any actions to control the scene.
- √ Use minimum number of personnel for initial approach and size-up.
- √ Until the material is positively identified and the specific hazards are known, use only personnel with the proper level of protective clothing and SCBA.
- √ Identify incoming resources
- √ Position vehicles for leaving area.

### **Concept of intelligence versus information at Hazmat incident:**

Information can be thought of as raw facts or data, often the first field reports. While intelligence is based on information that is verified, organized, analyzed, prioritized and useful. Information is required to gather intelligence, and intelligence is needed to perform hazard assessment.

## Hazmat Recognition Clues

There are many clues that can be used in Hazard Recognition:

- √ Occupancy / Location: e.g., residential garage or highway.
- √ Container shapes: e.g., 55 Gallon drum or ribbed tanker.
- √ Markings and colors: e.g., white placard with skull and crossbones = Poison.
- √ Shipping Papers and MSDS: e.g., consist for railroad incident.
- √ Senses: i.e., sight, hearing and smell.

There are some warning systems, such as **DOT placards** and labels and **NFPA 704 placards**, that actually identify the particular hazard class, or classes, present at an emergency. However, due to the limitations of these systems, responders should attempt to obtain transportation **shipping papers**, or fixed facility **inventory statements**, to find out exactly what chemicals are involved. After obtaining these documents, and before any in-depth incident mitigation or remedial actions is initiated, responders need to consult more *detailed and specific information* regarding the actual products. The various sources available to responders generally fall into one of the following four categories:

- √ Chemical Reference Books
- √ Emergency Information Telephone Services
- √ Computerized Chemical Data Bases
- √ Direct on-scene advice from expert sources

Computerized chemical data bases are now being commonly used and carried by Hazardous Materials Response Teams. One such data base is the Computer Aided Management of Emergency Operations (**CAMEO**) system developed by the National Oceanic and Atmospheric Administration (NOAA).

## Material Safety Data Sheets (MSDS)

Material Safety Data Sheets are one of the best sources of specific information about products that is commonly available to responders in the field. The contents of an MSDS are regulated by the Department of Labor (DOL). The DOL has determined what is the minimum information required in an MSDS. Unfortunately, there is no standardized form, so responders must be familiar with the information available on an MSDS and know where to locate the information. This section provides the needed background to understand and interpret the information held on an MSDS.

### Information Required on Material Safety Data Sheets (MSDS)

Each Material Safety Data Sheet must contain, as a minimum, the following information:

1. The specific chemical identity of the hazardous substance and other names or, if it is a mixture, its components (over 1% or 0.1% if a carcinogen) that contribute to the hazard of the mixture.
2. The Chemical Abstracts Service (CAS) number of the hazardous substance, and/or the CAS numbers of all the ingredients that have been determined to be health hazards.
3. The potential for fire and/or explosion, including vapor pressure, boiling range, percentage of volatility, etc.
4. The physical properties of the hazardous substance, including vapor pressure, boiling range, percentage of volatility, etc.
5. Reactivity. Any conditions that may cause a dangerous reaction must be included.
6. The health risks of overexposure, including both acute and chronic effect.
7. Any medical conditions that are generally recognized as being aggravated by exposure to the substance.
8. The primary route(s) of entry, including inhalation, eye contact, and ingestion.

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**HAZARDOUS MATERIALS ON-SCENE  
INCIDENT COMMANDER**

9. The OSHA Permissible Exposure Limit (PEL), ACGIH Threshold Limit Value (TLV), and any other exposure limit used or recommended by the person preparing the MSDS.
10. Whether it is a carcinogen according to the regulation. If an ingredient is a carcinogen under subsection (d) (4) of the regulation, it must be listed as a carcinogen if the concentration is 0.1% or higher.
11. Personal protective equipment. The information should be specific, for example, types of respirator to be used, glove materials, etc.
12. Emergency and first aid procedures. What to do in case of inhalation, skin contact, eye contact, and ingestion, etc.
13. Spills/disposals. Practical guidance that can be used in an emergency to control a spill and protect employees.
14. Fire conditions. How firefighters should protect themselves and others, extinguishing media, hazardous combustion by-products, etc.
15. The date of preparation of the MSDS, and/or the date of the latest revision. If an MSDS is revised, this should be noted.
16. The name, address, and telephone number of the person preparing the MSDS.
17. An explanation in lay terms of the specific potential health risks posed by the hazardous substance that can be understood by persons without medical training.
18. Any generally known precautions for safe handling and use of the hazardous substance.

**Note:** If some of the information required is unavailable to the person preparing the MSDS, or if any of the information is not applicable to the specific substance, this should be so stated. Blank spaces on the form are not allowed.

## DOT Shipping Papers

Due to the ambiguity and inadequacy of the DOT Placarding System, the authors feel that one of the best sources of information regarding the type of hazardous materials being transported is the shipping papers.

The following table depicts the name and location of the shipping papers for the various modes of transportation:

| Mode of Transportation | Name of papers           | Location                                 |
|------------------------|--------------------------|------------------------------------------|
| Highway                | Bill of Lading           | In the Cab of the Vehicle                |
| Railroad               | Waybill & Cargo Consist  | In the Possession of a Train Crew Member |
| Marine                 | Hazardous Cargo Manifest | In a Holder on the Bridge of the Vessel  |
| Aircraft               | Air bill                 | In the Aircraft Pilot's Possession       |

**Shipping papers must include the eight following information:**

1. Type of **packaging**
2. **Number** of packages
3. Proper **shipping name** from CFR 49
4. Proper **Hazard Class** from CFR 49
5. United Nations **four-digit ID number**
6. Correct **weight** or **volume**
7. The **shipper's name** and **address**
8. The **consignee's name** and **address**

**Note:** Information is standardized, however the format will vary.

## **Pesticide Labeling**

The information contained in Pesticide labels is regulated by the Environmental Protection Agency (EPA). Pesticide labels must contain the following information:

### **PRODUCT NAMES such as:**

Phosdrin 4E, Malathion, Thimet 15-G

### **SIGNAL WORD**

High toxicity: DANGER  
Moderate toxicity: WARNING  
Low order toxicity: CAUTION

### **INGREDIENT STATEMENT**

(active & inert)

Active ingredients must be listed by chemical name and percentage. Inert ingredients are usually only listed by percentage and therefore may be misleading, as they may contain flammable solvents.

### **EPA REGISTRATION NUMBER**

This number ensures positive identification of the product.

### **STATEMENT OF PHYSICAL OR CHEMICAL HAZARDS**

List of any special flammability, explosive, or reactive hazards.

Pesticide labels may also include the following information:

**STATEMENT OF PRACTICAL TREATMENT**

Includes precautionary information, First-Aid for exposure, and “Note to the Physician” (antidotal information).

**EPA ESTABLISHMENT NUMBER**

Denotes facility where pesticide was made (not to be confused with the EPA registration number).

**INFORMATION ON STORAGE, DISPOSAL,  
ENVIRONMENTAL, OR WILDLIFE HAZARDS**

As appropriate.

HERBICIDE  
WETTABLE POWDER

|                    |                            |        |
|--------------------|----------------------------|--------|
| ACTIVE INGREDIENT: | weed out (triazoloic acid) | 80.0%  |
| INERT INGREDIENTS: |                            | 20.0%  |
| TOTAL:             |                            | 100.0% |

KEEP OUT OF REACH OF CHILDREN

## CAUTION

### STATEMENT OF PRACTICAL TREATMENT

In case of contact, wash skin with plenty of soap and water.  
Get medical attention if irritation persists.

### PRECAUTIONARY STATEMENTS

Hazard to Humans  
and Domestic Animals

Harmful if swallowed, inhaled, or absorbed through the skin.  
Avoid breathing dust or spray mist. Avoid contact with skin,  
eyes, or clothing. Wash thoroughly after handling. Remove and  
wash contaminated clothing before reuse.

### Environmental Hazards

Keep out of lakes, streams, or ponds. Do not apply when weather  
conditions favor drifts from target area.

A-Z

A-Z Chemicals, Inc.  
Chemcity, Minnesota 55888

EPA Reg. No. 102357-41  
EPA Est. 102357-MN-1

Net Weight 5 Pounds



## A Toxicity Comparison Chart of Pesticide Label Signal Words

| SIGNAL WORDS          | TOXICITY              | APPROXIMATE<br>AMOUNT<br>NEEDED TO KILL<br>THE AVERAGE<br>PERSON | EPA<br>CATEGORY<br>(LD50) |
|-----------------------|-----------------------|------------------------------------------------------------------|---------------------------|
| <b><i>DANGER</i></b>  | Highly Toxic          | A taste to a<br>teaspoon                                         | 1<br>(0-50 MG/KG)         |
| <b><i>WARNING</i></b> | Moderately<br>Toxic   | A teaspoon to<br>A tablespoon                                    | 2<br>(50-500 MG/KG)       |
| <b><i>CAUTION</i></b> | Low-Order<br>Toxicity | An ounce to<br>more than a pint                                  | 3<br>(50-5000 MG/KG)      |

## NFPA 704 System Fixed Facility Placarding



### Flammability

- 4 Extremely Flammable Gases and Very Volatile Liquids
- 3 Ignites at Normal Temperatures
- 2 Ignites When Heated
- 1 Must be Preheated to Burn
- 0 Will Not Burn



### Health

- 4 Requires SPECIAL Protective Clothing
- 3 Extremely Dangerous! Wear FULL Protective Clothing
- 2 Hazardous: Use S.C.B.A.
- 1 Slightly Hazardous: S.C.B.A. Desirable
- 0 Ordinary Combustible Material




### Instability/Reactivity

- 4 May DETONATE at Normal Temperatures!  
Vacate Area if Materials are Exposed to FIRE.
- 3 Strong SHOCK or HEAT may DETONATE. Use Monitors  
From Behind Explosion-Resistant Barriers.
- 2 Possibly VIOLENT Chemical Change. Use Hose Streams  
from a Distance.
- 1 Unstable if Heated. Use CAUTION.
- 0 Normally Stable



### Special Hazard

- W Water Reactive
- OXY Oxidizing Chemicals
-  Radiation Hazard
- POL Hazardous Polymerization
- EXP Explosive -- Heat or Shock Sensitive



## Placards & Labels

Shipments of Hazardous Materials are subject to the requirements of U.S. Code of Federal Regulations (CFR Title 49) and are administered by the ***Department of Transportation*** through the following agencies:

1. Federal Highway Administration (FHA)
2. Federal Railroad Administration (FRA)
3. U.S. Coast Guard
4. Federal Aviation Administration (FAA)
5. Office of Pipeline Safety (OPS)

The DOT Identification System uses ***Placards*** which are located on all four sides of the transportation vessel and ***Labels*** which are located on one side of the container package.

***Placards*** contain four (4) pieces of information:













1. Hazard Class Name or UN 4-digit ID Number
2. Hazard Class Number
3. Color
4. Pictograph



***Labels*** contain four (4) pieces of information:

1. Hazard Class Name
2. Hazard Class Number
3. Color
4. Pictograph

Pictograph Hazard Class Hazard Class

|                                                                                     |               |   |         |
|-------------------------------------------------------------------------------------|---------------|---|---------|
|    | Explosive     | 1 | Orange  |
|    |               | 2 | White   |
|    |               | 2 | Green   |
|    |               | 2 | Red     |
|   |               | 3 | Red     |
|  |               | 4 | Red/    |
|  | Flammable     | 4 | Blue    |
|  |               | 5 | Yellow  |
|  |               | 6 | White   |
|  | Radioactive   | 7 | Yellow/ |
|  | Corrosive     | 8 | Black/  |
|  | Miscellaneous | 9 | Black/  |

## Table I Materials

Motor vehicles, freight containers, and rail cars containing any quantity of hazardous materials listed in Table I ***must be placarded***.

| <u>Hazard Class Name</u>                   | <u>Hazard Class #</u> |
|--------------------------------------------|-----------------------|
| Explosives 1.1                             | 1                     |
| Explosives 1.2                             | 1                     |
| Explosives 1.3                             | 1                     |
| Poison Gas/Inhalation Hazard               | 2                     |
| Dangerous when wet                         | 4                     |
| Organic Peroxide                           | 5                     |
| Poison (Inhalation Hazard-Packing Group I) | 6                     |
| Radioactive III                            | 7                     |

## Table II Materials

Motor vehicles, freight containers, and rail cars containing ***1,001 pounds*** or more gross weight (or 110 gallons in a single container) of hazardous materials listed in Table II ***must be placarded***. The Dangerous placard may be used to identify that a combination of materials listed under Table II is being transported in a quantity which exceeds 1,001 pounds.

| <u>Hazard Class Name</u>            | <u>Hazard Class #</u> |
|-------------------------------------|-----------------------|
| Explosive 1.4                       | 1                     |
| Explosive 1.5                       | 1                     |
| Explosive 1.6                       | 1                     |
| Flammable Gas                       | 2                     |
| Non-Flammable Gas                   | 2                     |
| Flammable Liquid                    | 3                     |
| Combustible Liquid                  | 3                     |
| Flammable Solid                     | 4                     |
| Spontaneously Combustible           | 4                     |
| Oxidizer                            | 5                     |
| Organic Peroxide                    | 5                     |
| Poison (Non-Inhalation Hazard Only) | 6                     |
| Keep Away From Food                 | 6                     |
| Corrosive                           | 8                     |
| Miscellaneous Hazardous Materials   | 9                     |

## **Combination Load Rule**

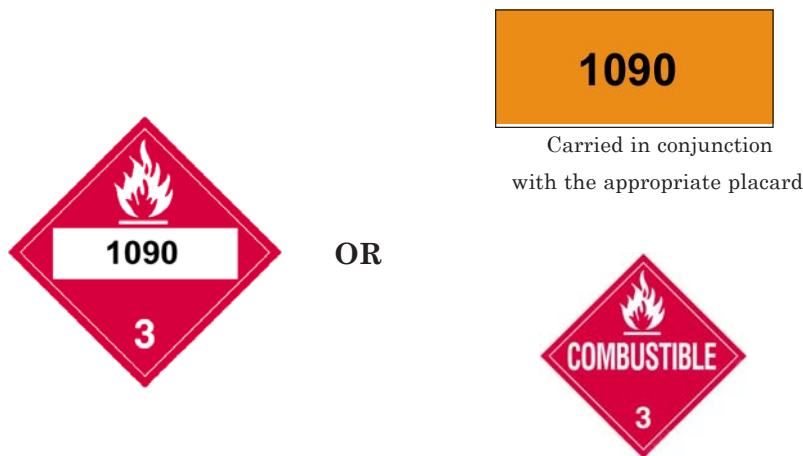
When two or more Table II materials are transported together in aggregate gross weight of 1,001 pounds or more, the Dangerous Placard must be used.

**Example: 600 lbs. Oxidizers + 500 lbs. Corrosives**



Note: All Table I materials must be placarded with the appropriate placard for that particular hazard.

When hazardous materials are transported in *Cargo Tanks*, *Tank Cars* and *Portable Tanks*, the Four-Digit United Nations Identification Number must be displayed on either:



#### Placards

The UN Identification Number is NOT required on Placards used on flat bed trucks, box cars, or containerized units.

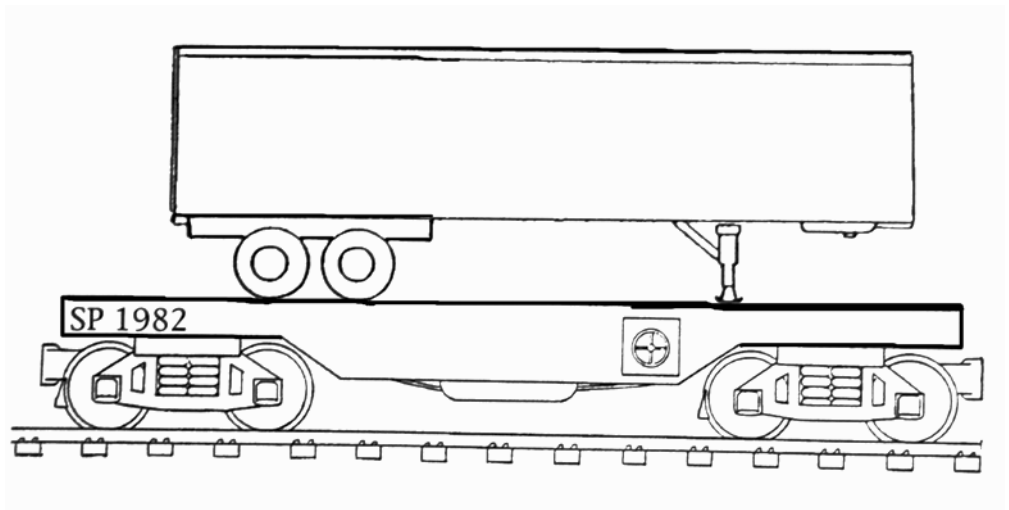
#### Orange Panels

**Note:** Do not confuse the *four-digit* United Nations Identification Number with the *single-digit* UN Hazard Class Number. The four digit UN Identification Numbers for the individual products can be found in the tables of Section 172.101 and 172.102 *Code of Federal Regulations*, Title 49, Parts 100-199. These numbers can be used to access emergency action guidelines from the *DOT Emergency Response Guidebook*.

**OR**

When hazardous materials are transported by railroad, ANY amount of product requires that the transportation vessel be placarded, EXCEPT for materials transported by a “trailer on a flat car” (TOFC), or a “container on a flat car” (COFC).

**TOFC**





## Placarding Priorities

If a hazardous material has more than one dangerous property, it is labeled and placarded according to the most dangerous of these properties. This determination is made from the following PRIORITY list: (note that explosives and etiological agents must be identified as such at all times).

1. Radioactive
2. Inhalation Hazard
3. Flammable Gas
4. Non-Flammable Gas
5. Flammable Liquid
6. Oxidizer
7. Flammable Solid
8. Corrosive Liquid
9. Poison (Liquid, Solid)
10. Corrosive Solid
11. Irritating Materials
12. Combustible Materials

The following are examples of this Prioritizing System:

- √ Chlorine  
(Poison Gas, Oxidizer, and Corrosive) = **Inhalation Hazard**  
Placard
- √ Nitric Acid  
(Corrosive, Oxidizer, and Poison) = **Oxidizer** Placard
- √ Anhydrous Dimethylamine  
(Poison, Corrosive, and Flammable Liquid) = **Flammable Liquid** Placard

### ***Safety Key Point***

Always Consider the Possibility of **Multiple Hazard Categories** in **Each** Hazard Class.

**HAZARDOUS MATERIALS ON-SCENE  
INCIDENT COMMANDER**

| <i><b>PLACARD</b></i>                 | <i><b>HAZARDOUS MATERIALS THAT MAY BE PRESENT</b></i>                             |
|---------------------------------------|-----------------------------------------------------------------------------------|
| EXPLOSIVE 1.5                         | 1001 POUNDS OR MORE -- EXPLOSIVE 1.5                                              |
| CORROSIVE                             | 1001 POUNDS OR MORE -- A CORROSIVE MATERIAL                                       |
| DANGEROUS                             | 1001 POUNDS OR MORE -- A COMBINATION OF MATERIALS FROM TABLE 2                    |
| EXPLOSIVE 1.1                         | ANY QUANTITY -- EXPLOSIVE 1.1                                                     |
| EXPLOSIVE 1.2                         | ANY QUANTITY -- EXPLOSIVE 1.2                                                     |
| FLAMMABLE                             | 1001 POUNDS OR MORE -- FLAMMABLE LIQUID<br>1001 POUNDS OR MORE -- FLAMMABLE SOLID |
| FLAMMABLE GAS                         | 1001 POUNDS OR MORE -- FLAMMABLE GAS                                              |
| FLAMMABLE SOLID                       | 1001 POUNDS OR MORE -- FLAMMABLE SOLID                                            |
| FLAMMABLE SOLID<br>DANGEROUS WHEN WET | ANY QUANTITY -- FLAMMABLE SOLID THAT IS<br>DANGEROUS WHEN WET                     |
| NON-FLAMMABLE GAS                     | 1001 POUNDS OR MORE -- NON-FLAMMABLE GAS                                          |
| ORGANIC PEROXIDE                      | 1001 POUNDS OR MORE -- ORGANIC PEROXIDE                                           |
| OXIDIZER                              | 1001 POUNDS OR MORE -- OXIDIZER                                                   |
| OXYGEN                                | 1001 POUNDS OR MORE -- LIQUEFIED OXYGEN                                           |
| POISON                                | 1001 POUNDS OR MORE -- POISON                                                     |
| INHALATION HAZARD                     | ANY QUANTITY -- POISON GAS                                                        |
| RADIOACTIVE<br>RADIOACTIVE            | ANY QUANTITY -- RADIOACTIVE MATERIAL WITH A<br>CLASS III LABEL                    |

# DOT Placards & Labels Self-Study Guide

| HAZARD CLASS              | PLACARD COLOR | LABEL COLOR | HAZARD CLASS # | TABLE 1 OR 2 MATERIAL |
|---------------------------|---------------|-------------|----------------|-----------------------|
| Explosives 1.1            |               |             |                |                       |
| Explosives 1.2            |               |             |                |                       |
| Explosives 1.3            |               |             |                |                       |
| Explosives 1.4            |               |             |                |                       |
| Explosives 1.5            |               |             |                |                       |
| Explosives 1.6            |               |             |                |                       |
| Inhalation Hazard         |               |             |                |                       |
| Flammable Gas             |               |             |                |                       |
| Non-Flammable Gas         |               |             |                |                       |
| Flammable Liquid          |               |             |                |                       |
| Combustible Liquid        |               |             |                |                       |
| Flammable Solid           |               |             |                |                       |
| Spontaneously Combustible |               |             |                |                       |
| Dangerous when wet        |               |             |                |                       |
| Oxidizers                 |               |             |                |                       |
| Organic Peroxide          |               |             |                |                       |
| Poison                    |               |             |                |                       |
| Radioactive I             |               |             |                |                       |
| Radioactive II            |               |             |                |                       |
| Radioactive III           |               |             |                |                       |
| Corrosive                 |               |             |                |                       |
| Miscellaneous             |               |             |                |                       |
| Irritant                  |               |             |                |                       |
| Etiological               |               |             |                |                       |

The “Dangerous” placard is required for the following loads:

- 1.
- 2.
- 3.

# Essential Information Test

Determine the Placard Requirements for the following loads:

| Load                                                      | Placard |
|-----------------------------------------------------------|---------|
| 700 lbs. Oxidizer                                         |         |
| 800 lbs Explosive 1.2                                     |         |
| 5,000 lbs Corrosives + 800 lbs. Flammable Liquids         |         |
| 10 gals. Inhalation Hazard                                |         |
| 600 lbs. Flammable Solids + 1000 lbs. Flammable Liquids   |         |
| 100 lbs. Oxidizers + 100 lbs. Corrosives                  |         |
| 900 lbs Explosives 1.4                                    |         |
| 50 gals. Gasoline                                         |         |
| 150 gals. Poison                                          |         |
| 800 lbs. Organic Peroxides + 800 lbs. Corrosives          |         |
| 900 lbs. Radioactive III                                  |         |
| 100 lbs. Radioactive I + 100 lbs. Corrosives              |         |
| 4,000 lbs. Flammable Solids + 100 gals. Flammable Liquids |         |
| 900 lbs. Dangerous When Wet                               |         |

## Container Recognition in Highway Emergencies

### Highway Container Profile Recognition Examples

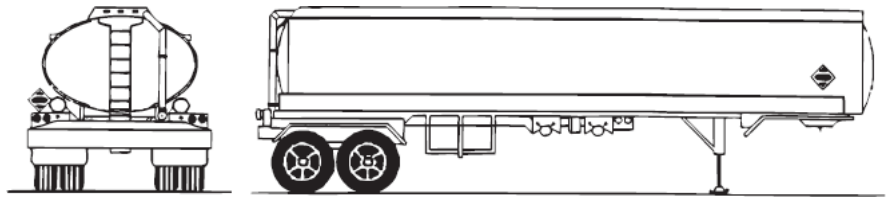
It is extremely important for first-in responding personnel to recognize the presence of hazardous material involvement in an incident long before actually becoming committed to any course of action. Of course, the presence of placards and labels give the obvious warning signs. However, the shape, or profile, of the transportation unit can also be a very good indication of the type of product that may be involved in the incident. The ability to recognize what type of hazards the various silhouettes may present gives the responding units the opportunity to take the appropriate precautionary actions and thereby ***avoid becoming part of the problem.***

### Highway Cargo Tanks

The DOT term for tank trailers is cargo tanks and these are identified by five basic specifications:

1. Non-pressured tanks MC 306 series
2. Low-pressure tanks MC 307 series
3. Corrosive tanks MC 312 series
4. High pressure tanks MC 330/331 series
5. Cryogenic tanks MC 338 series

### DOT 406/MC 306 Series

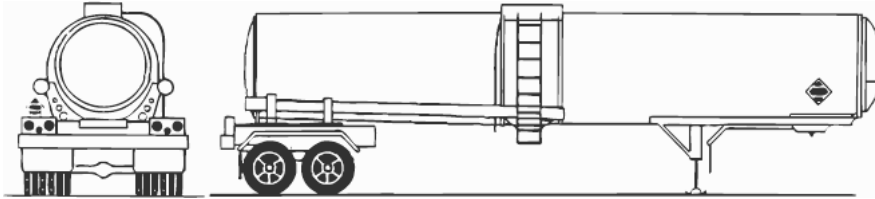


- Non-pressurized oval-shaped vessel
- Popular name: skin-tank
- Products carried: Flammable & combustible liquids, solvents with low vapor pressures, and products such as milk
- Most MC 306 tanks are constructed with aluminum.
- Pressure relief devices limit the pressure in the tank to no more than 3 psig.

**Note:** The support legs at the front end of an MC 306 are not designed to withstand the weight of a fully loaded cargo tank. Therefore, separation of a fully loaded tank from its power unit can result in rupture of the tank by the support legs which could release a massive amount of the product.

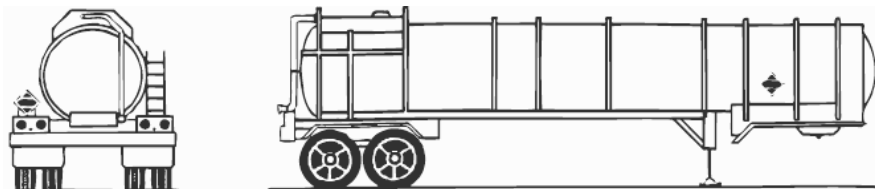
**Warning:** Due to the lack of structural soundness of the aluminum skin, an overturned MC 306 must be off-loaded before any attempt to upright is made.

## MC 407/307 Series



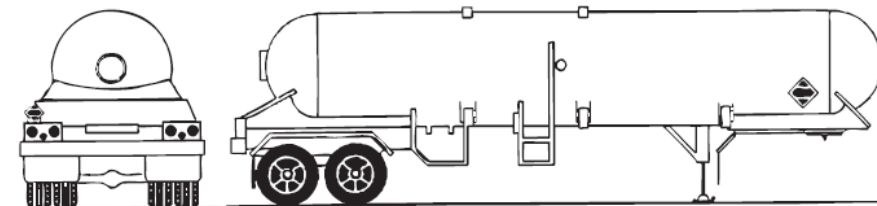
- ✓ Low pressure tank.
- ✓ Popular name: general chemical trailer
- ✓ Products carried: Poison liquids (Poison B), mild corrosives, and volatile flammable liquids
- ✓ MC 307 tanks cannot be used to carry strong corrosives.
- ✓ Designed for working pressure of up to 25 psig.
- ✓ MC 307 tanks usually have a horseshoe shaped cross-section.

## DOT 412/MC 312 Series



- ✓ Popular name: corrosive tank
- ✓ Products carried: Strong acids and bases such as sodium hydroxide, hydrochloric acid and acetyl chloride
- ✓ Designed for pressures between 35 to 50 psig.
- ✓ MC 312 tanks have a smaller capacity than any of the other cargo tank series due to product density, and therefore have smaller diameter tanks than the MC 307 series.
- ✓ Support rings around the tank give additional strength to the unit.
- ✓ Most MC 312 tanks are lined.

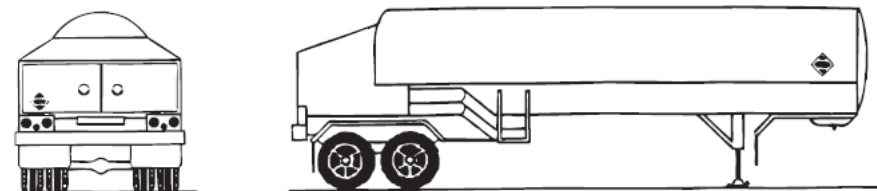
### MC 330/331 Series



- ✓ MC 330/331 tanks are true high pressure vessels designed for working pressure between 100 and 500 psig.
- ✓ Products carried: Compressed gases and very hazardous liquids such as anhydrous ammonia, chlorine, liquefied petroleum gas, liquid methyl parathion
- ✓ MC 330/331 tanks have a cylindrical shape, with hemispherical heads

**Warning:** Incidents involving MC 330/331 tanks have a severe *BLEVE potential.*

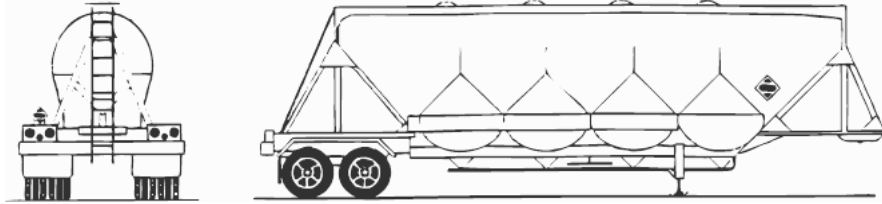
### MC 338



- ✓ May carry up to 13,000 gallons of substance.
- ✓ Products carried: Liquid argon (will displace oxygen), liquid oxygen (will vigorously accelerate combustion), liquid methane (will burn with explosive force)
- ✓ Leaks produce tremendous quantities of gas due to extreme expansion ratios. For example, 1 volume of liquid methane will produce 630 volumes of methane gas.
- ✓ Cryogenic materials are extremely cold. They will produce severe burns.

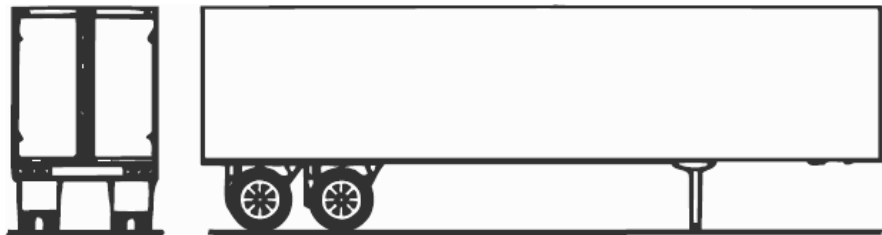


## Dry Bulk Carrier



- ✓ Used to carry a variety of products including some hazardous materials, such as fertilizers (ammonium nitrate) and plastic pellets.

## Cargo Van or Trailer



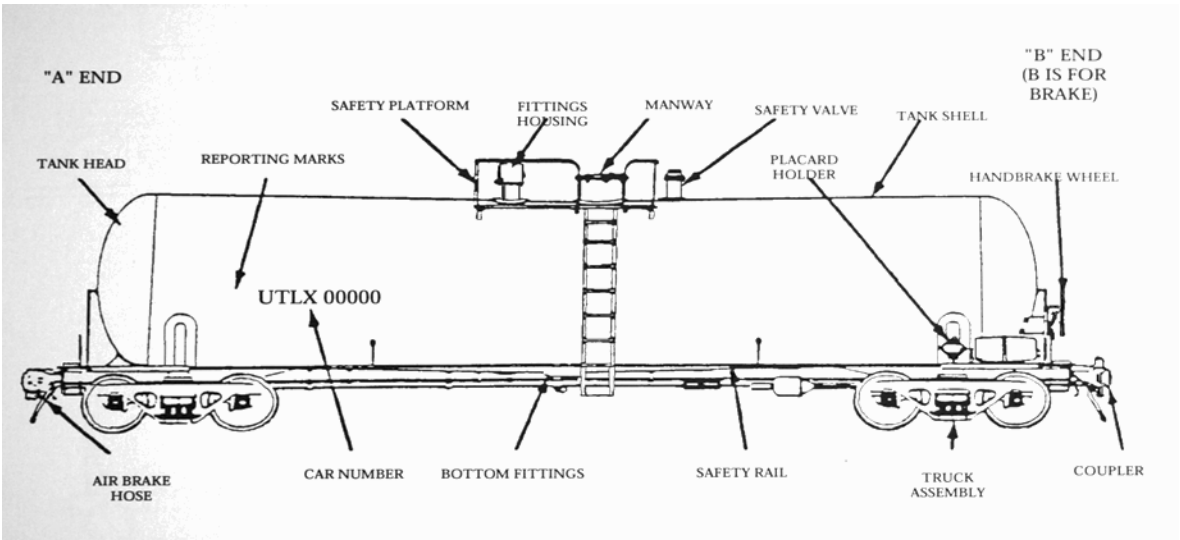
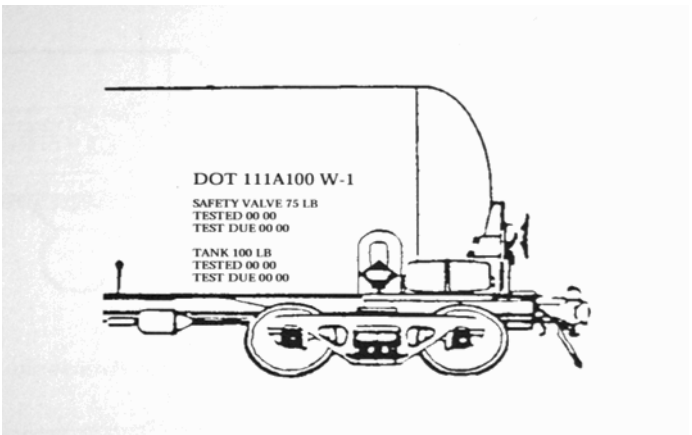
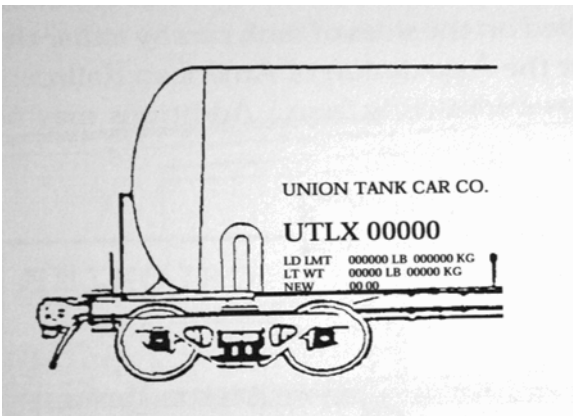
- ✓ May carry hazardous material or combination of hazardous materials.
- ✓ This profile gives little indication of contents of the vehicle.
- ✓ Verify contents through bill of lading (if there are no placards visible) before taking action.

## **Container Recognition in Railroad Emergencies**

### **Railroad Tank Car Profile Recognition Examples**

- √ Reporting Marks
- √ Specification Markings
- √ Stenciled Commodity Names
- √ Pressure Tank Car
- √ Non-pressure Tank Car
- √ Non-Pressure Car with Expansion Dome
- √ High Pressure Tank Car
- √ Cryogenic Tank Car
- √ Boxed Tank Type Cryogenic Car
- √ Intermodal Containers

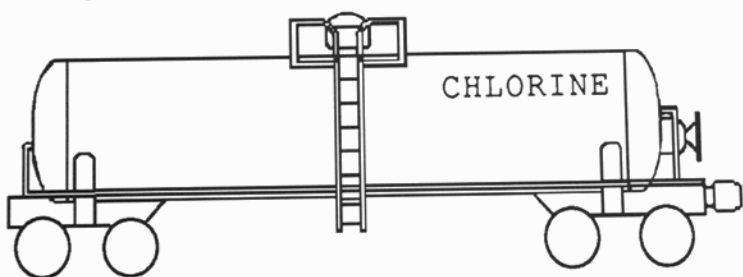
Understanding Railroad Tank Cars



## HAZARDOUS MATERIALS ON-SCENE INCIDENT COMMANDER

There are many hazardous materials whose proper shipping names must be stenciled onto each side of the tank car.

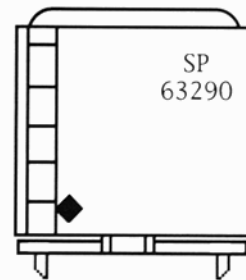
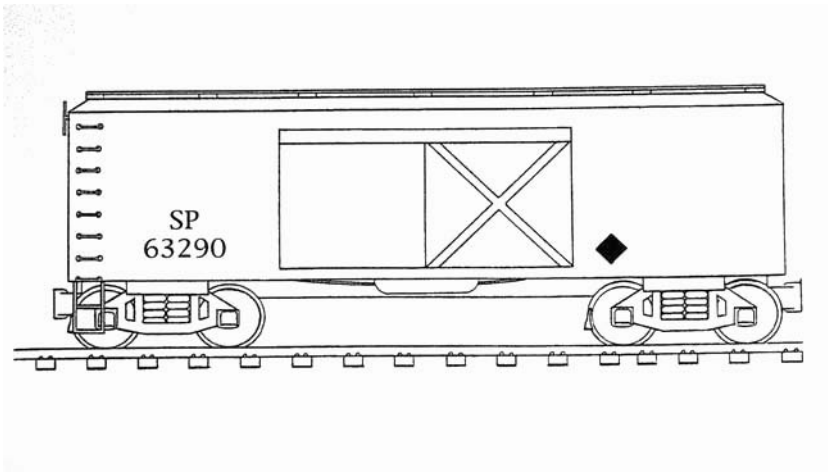
The following is a list of hazardous materials whose commodity names are required to be stenciled on the sides of tank cars by either the Department of Transportation or the Association of American Railroads. This list of commodities changes on a timely basis. Additions may be obtained by checking with AAR.



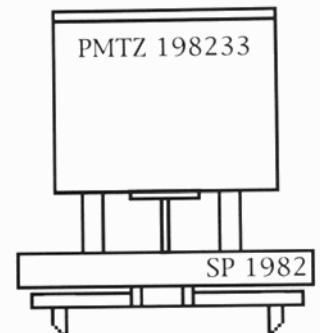
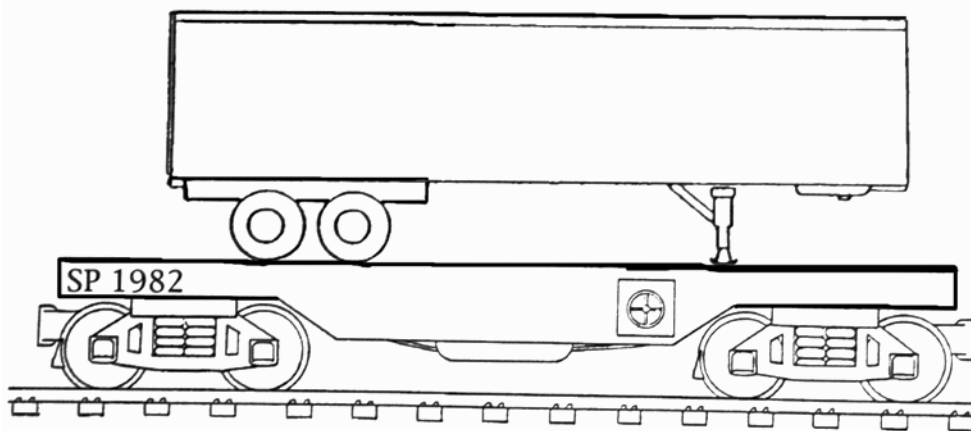
|                                                                   |                                         |
|-------------------------------------------------------------------|-----------------------------------------|
| Acrolein                                                          | Motor Fuel Antiknock Compound           |
| Anhydrous Ammonia                                                 | or Nitric Acid                          |
| Antiknock Compound                                                | Nitrogen Tetroxide                      |
| Bromine                                                           | Nitrogen Tetroxide-Nitric Oxide Mixture |
| Butadiene                                                         | Phosphorus                              |
| Chlorine                                                          | Sulfur Trioxide                         |
| Chloroprene (when transported in DOT 115A specification tank car) | Trifluorochloroethylene                 |
| Difluoroethane                                                    | Trimethylamine, Anhydrous               |
| Difluoromono-chloromethane                                        | Vinyl Chloride                          |
| Dimethylamine, Anhydrous                                          | Vinyl Fluoride Inhibited                |
| Dimethyl Ether (transported only in ton cylinders)                | Vinyl Methyl Ether Inhibited            |
| Ethylene Oxide                                                    |                                         |
| Formic Acid                                                       |                                         |
| Fused Potassium Nitrate and Sodium Nitrate                        |                                         |
| Hydrocyanic Acid                                                  |                                         |
| Hydrofluoric Acid                                                 |                                         |
| Hydrogen Chloride (by exemption from DOT)                         |                                         |
| Hydrogen Fluoride                                                 |                                         |
| Hydrogen Peroxide                                                 |                                         |
| Hydrogen Sulfide                                                  |                                         |
| Liquefied Hydrogen (May also be stenciled                         |                                         |
| Propane, Butane, Propylene, Ethylene)                             |                                         |
| Liquefied Petroleum Gas                                           |                                         |
| Methyl Acetylene Propadiene Stabilized                            |                                         |
| Methyl Chloride                                                   |                                         |
| Methyl Mercaptan                                                  |                                         |
| Methyl Chloride--Methylene Chloride Mixture                       |                                         |
| Monomethylamine, Anhydrous                                        |                                         |

## Identification Numbers and Placard Locations

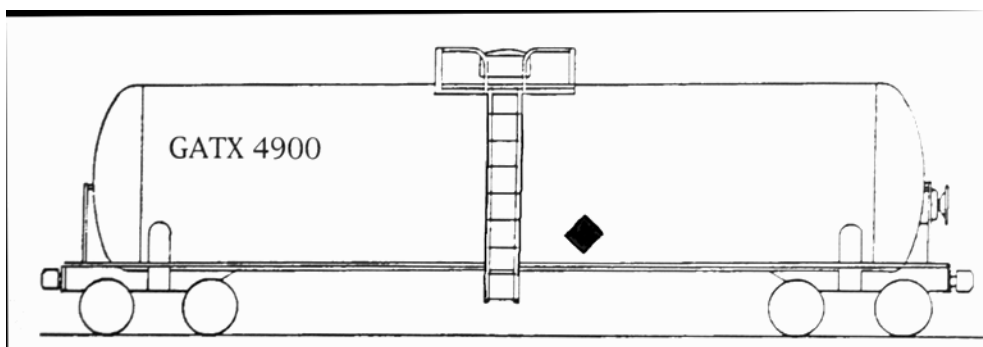
Railroad car identification numbers are located as shown below.  
The diamond indicates placarding locations.



Box Car



Flat Car



Tank Car

**HAZARDOUS MATERIALS ON-SCENE  
INCIDENT COMMANDER**

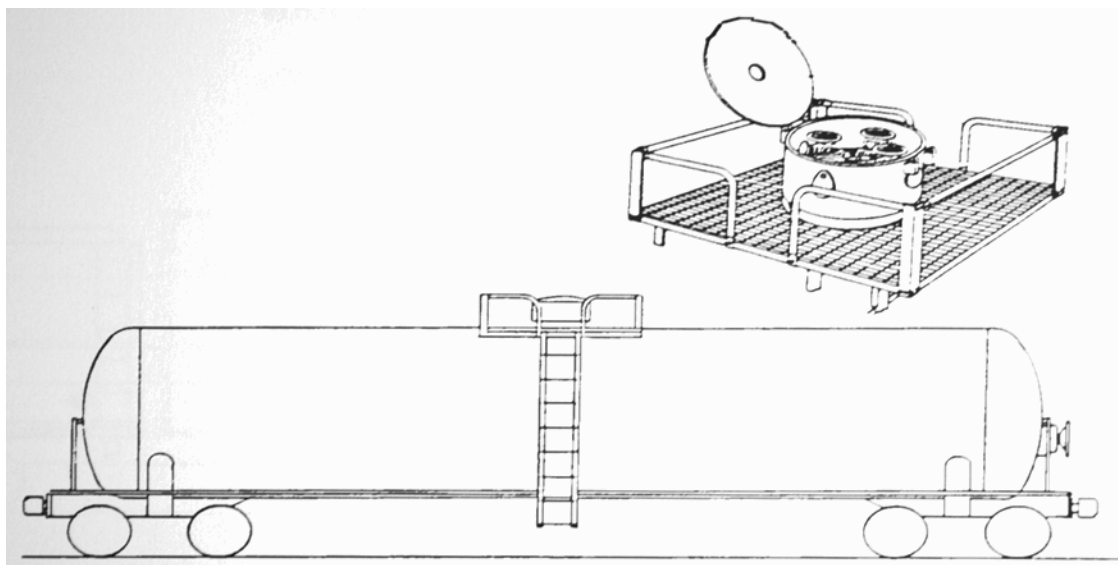


Diagram of a typical pressure tank car. Note protective housing.

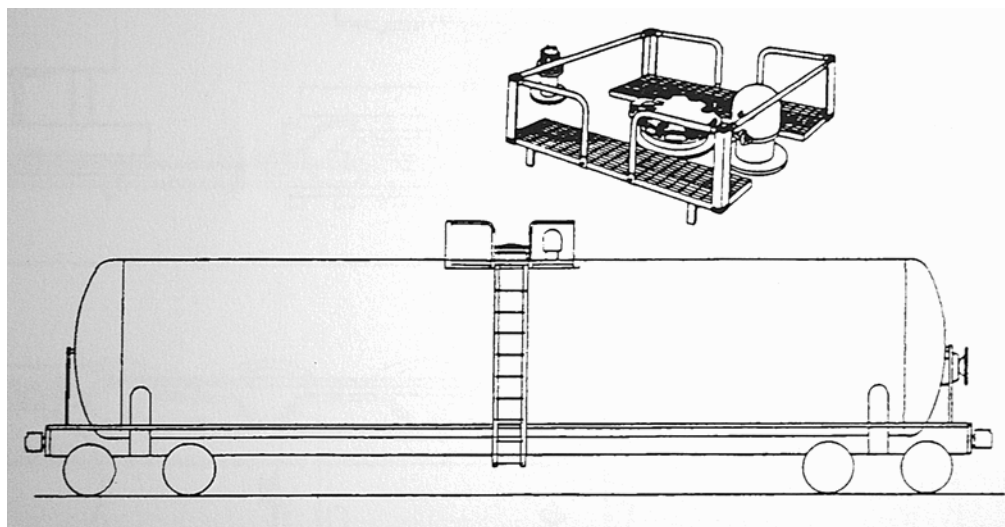


Diagram of a typical non-pressure tank car without expansion dome.

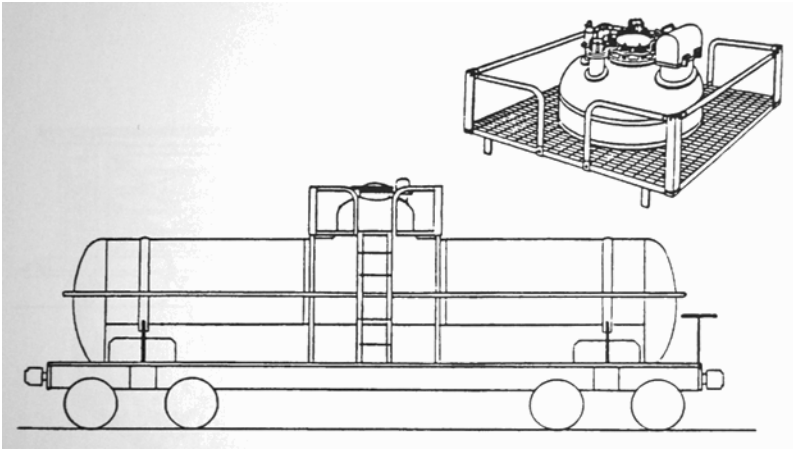
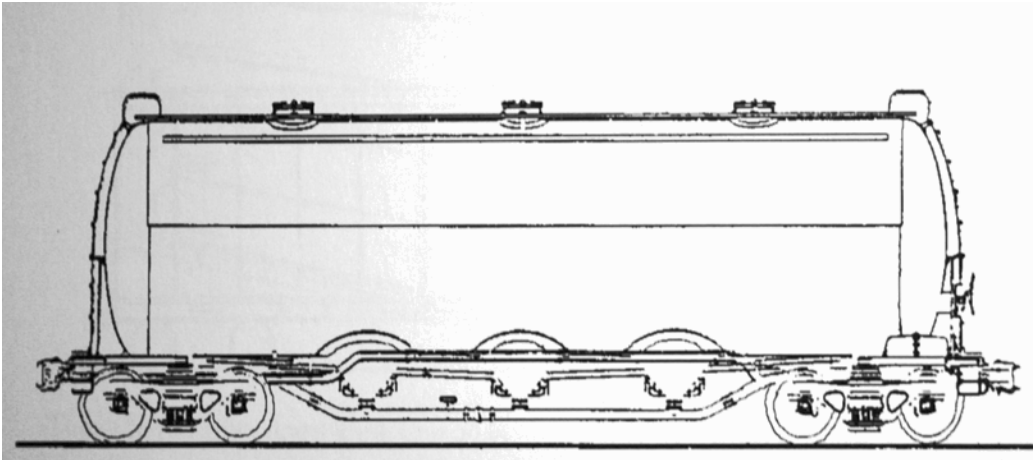
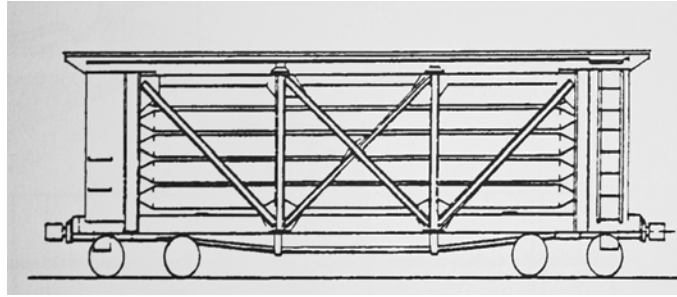


Diagram of a typical non-pressure tank care with expansion dome.

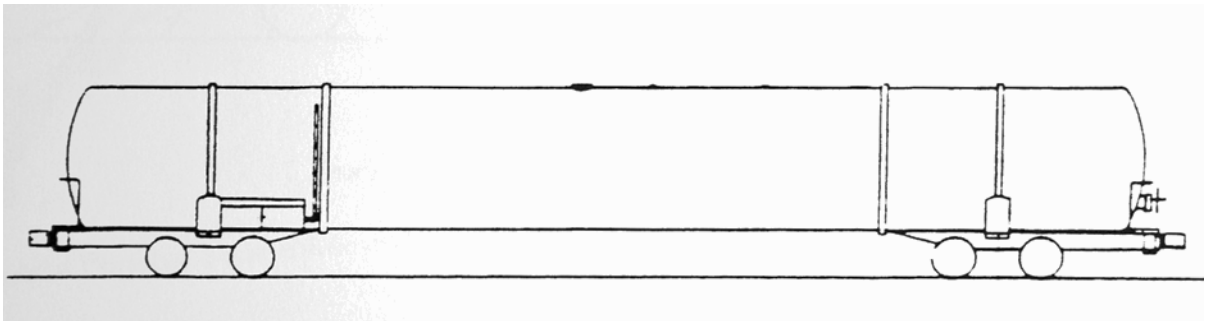


Tank Type Covered Hopper

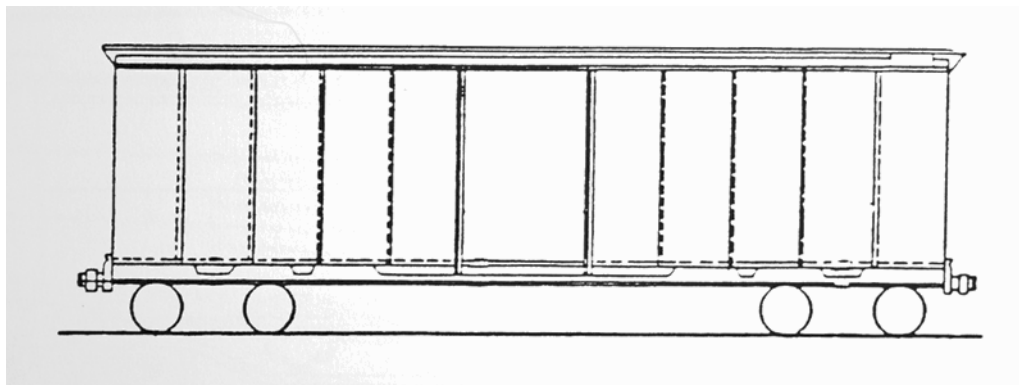
**HAZARDOUS MATERIALS ON-SCENE  
INCIDENT COMMANDER**



High pressure car.



Typical design of Cryogenic Liquid Tank Car.



Boxed tank type Cryogenic Liquid Tank Car.



## Introducing Intermodal Tank Containers

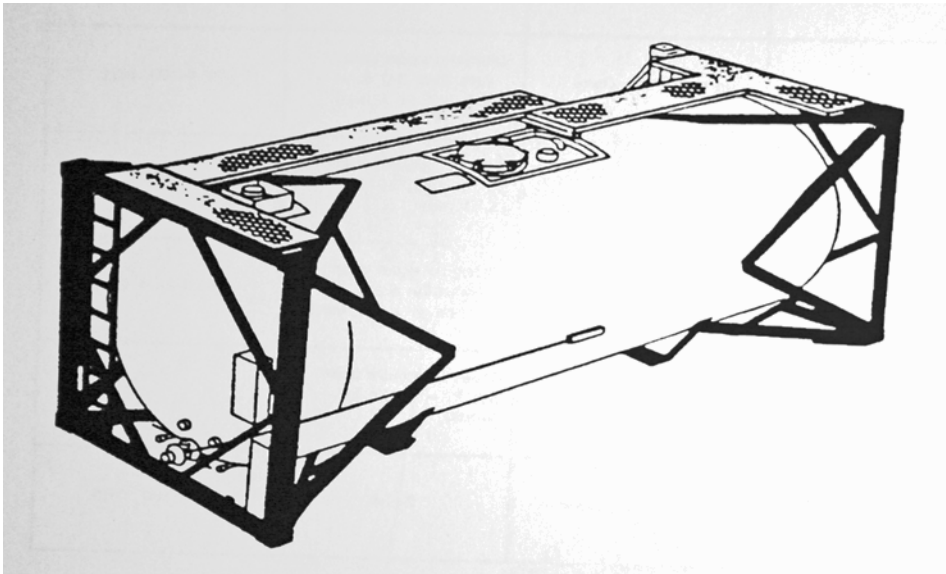
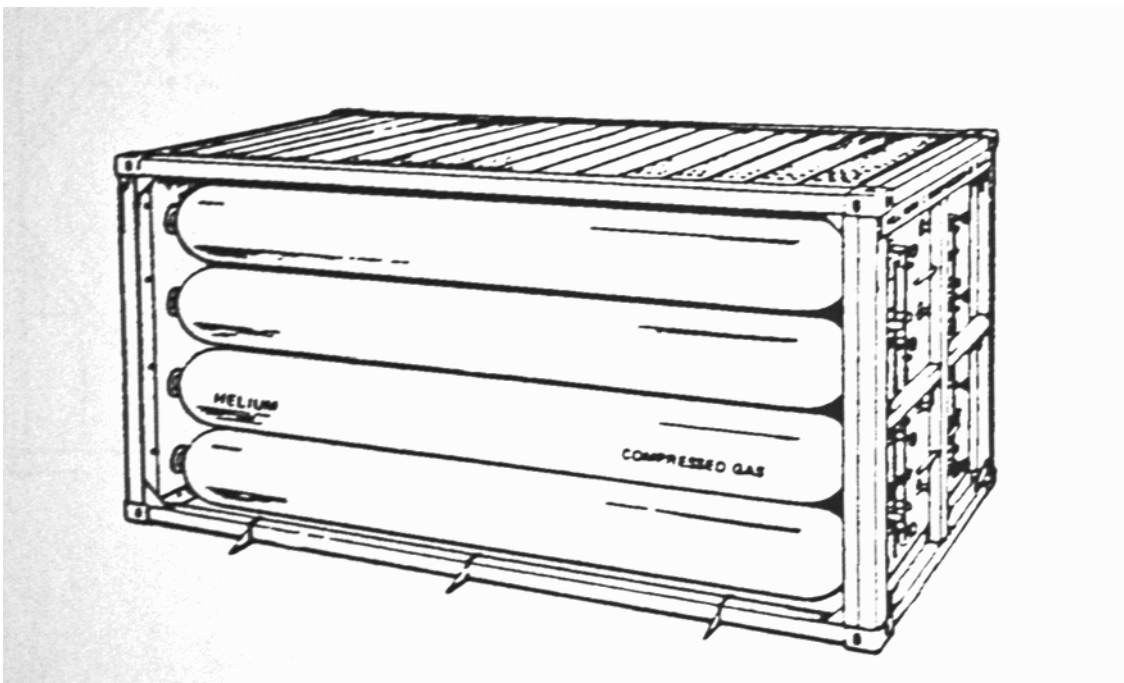


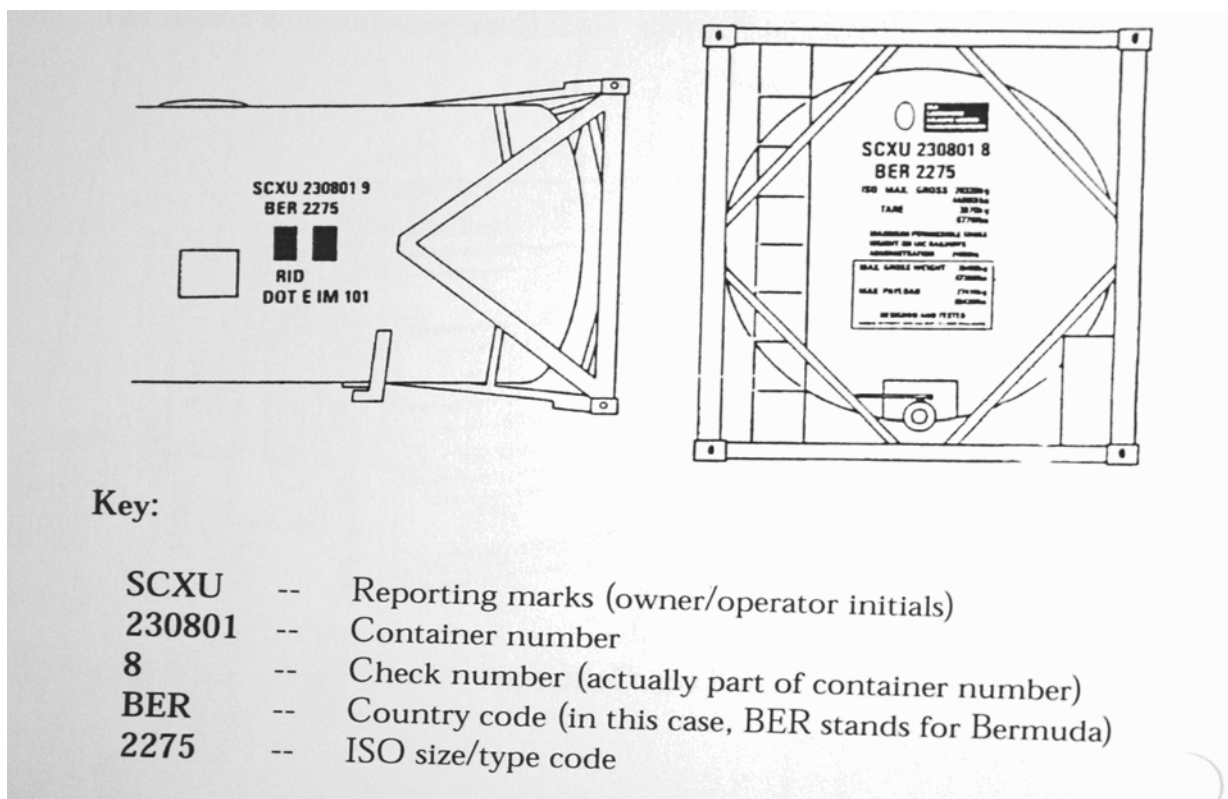
Illustration of Intermodal Portable Tank  
(Non-pressure tank container)



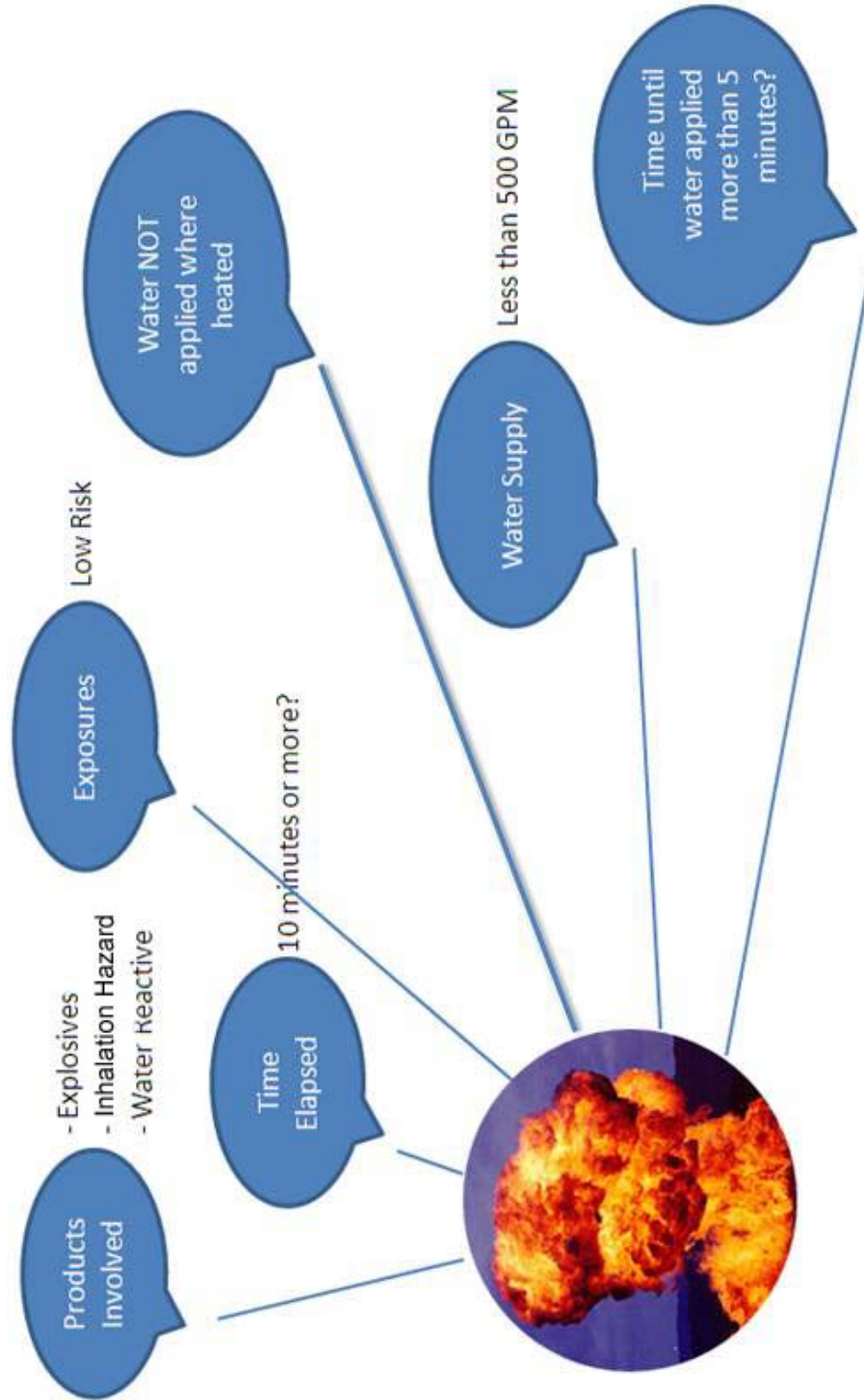
Tube Module Intermodal Tank Container

# Intermodal Containers Specifications

| SPECIFICATION | CAPACITY            | MINIMUM THICKNESS<br>HEAD & SHELL                             | DESIGN PRESSURE<br>(M.A.W.P.) |
|---------------|---------------------|---------------------------------------------------------------|-------------------------------|
| IM 101        | up to 6,300 gallons | Diameter equal to or<br>less than 5.9 ft --<br>0.197 in (5mm) | >25.4-100 pisig               |
|               |                     | Diameter greater than<br>5.9 ft. -- (6.35 mm)                 |                               |
| IM 102        | up to 6,300 gallons | Diameter equal to or<br>less than 5.9ft<br>0.125 in (3.18 mm) | >14.5=25.4 psig               |
|               |                     | Diameter greater than<br>5.9 ft. -- 0.157 in (4mm)            |                               |
| Spec 51       | up to 5,500 gallons | 3/16'                                                         | 100-500 psig                  |



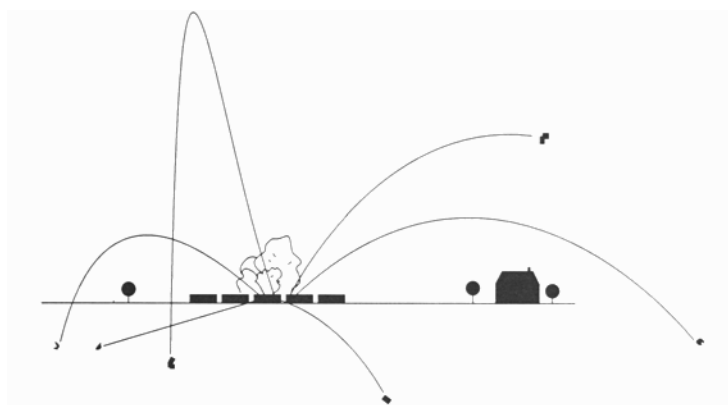
# Any yes answer can lead to evacuation



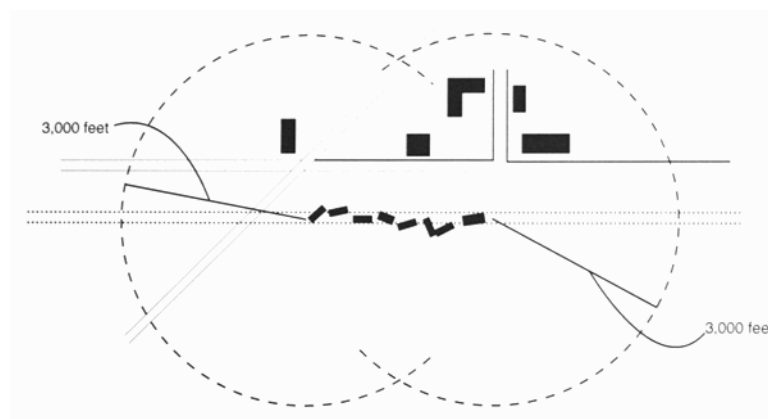
## Boiling Liquid Expanding Vapor Explosion (BLEVE)

This special type of explosion occurs when a liquid is above its boiling point and its container fails. When the container fails, the liquid vaporizes, and, if it is flammable, ignites, allowing the total quantity of energy available in the flammable material to be released over a very short period of time. Because the energy releases are so large, a minimum distance to evacuate from a railroad BLEVE is 2500 feet.

Any liquefied compressed gas is capable of BLEVE, even under non-fire conditions, if the container fails and ruptures.



Fragments both large and small can be hurled in every direction. Distances covered may be in excess of 2,000 feet.



Evacuation within a 3,000 foot radius is recommended. This will present many problems, particularly in densely populated areas.

## Toxic Exposure

A. The two basic forms of exposure are:

- Local Toxic Exposure

Results in action at contact site

- Systemic Toxic Exposure

Results in the material passing through skin, mucous membranes or lungs to the “site of action” via the bloodstream.

B. The four basic ways poisons are absorbed by the body:

- ✓ Inhalation
- ✓ Ingestion
- ✓ Dermal contact
- ✓ Injection

## Inhalation

Definition: *The breathing of airborne fumes, vapors, dusts, or particulate matter.*

Poisoning through inhalation at a hazardous materials incident can result from the following:

- ✓ Approaching scene from downwind
- ✓ A shift in wind direction
- ✓ Failure to wear positive-pressure, self-contained breathing apparatus
- ✓ Failure to decontaminate personnel, clothing, and equipment

## Ingestion

**Definition:** *The taking in of toxins via the mouth.*

Poisoning through ingestion at a hazardous materials incident can result from the following:

- ✓ Eating while contaminated
- ✓ Drinking while contaminated
- ✓ Smoking while contaminated
- ✓ Failure to decontaminate personnel, clothing, and equipment

## Dermal Contact

**Definition:** *Poisoning through direct contact with a toxic material.*

Poisoning can occur through direct skin contact—which is the most common way of becoming poisoned—or through the eyes, which is the fastest way of becoming poisoned as it goes through the central nervous system. To prevent poisoning through skin contact, emergency responders **MUST UTILIZE** the following:

- ✓ Appropriate protective clothing
- ✓ Eye protection
- ✓ Decontamination procedures

## Injection

**Definition:** *Poisoning through a puncture wound or break in the skin.*

The injection route of exposure is *generally* limited to medicine or drug abuse and is rarely encountered as an accidental route of exposure. However, injection has occurred through contact with jagged wreckage materials.

## Acute Toxicity

**Definition:** *Acute toxicity is the adverse effect a chemical can have as a result of a one-time exposure.*

## Chronic Toxicity

**Definition:** *Chronic toxicity is the adverse effect that a chemical can have as a result of a long-term, low-level exposure.*

## Immediate Exposure Effects

- √ Dizziness—vomiting—death
- √ Chemical/thermal burns
- √ Respiratory complications
- √ Central nervous system reactions
  - Twitching or tremors
  - Constriction of pupils
  - Profuse sweating
  - Headache
  - Chest and abdominal pain
  - Disorientation
  - Convulsions
  - Coma

## Delayed Exposure Effects

- √ Delayed central nervous system reactions
- √ Pulmonary edema
- √ Death or permanent disability

## Long-Term Exposure

- √ Decreased liver function
- √ Cancer
- √ Respiratory system breakdown
- √ Heart-related problems

**Exposure Records **Must** Indicate:**

- √ Date
- √ Time of day
- √ Incident Number
- √ Blood Gas Levels (Carboxy-Hemoglobin Test)
- √ Material Involved
- √ Level of Exposure
- √ Medical Treatment Received

**Specifically Indicate:**

1. Analysis is for Toxic Fire Gases
  - √ Carbon Monoxide
  - √ Methane
  - √ Cyanide
2. Exact levels are to be measured and recorded,  
**regardless of how low.**
3. Follow up toxicology analysis should be conducted at  
regular intervals

**Safety Key Point:**

**Never eat, smoke, or drink at or around hazardous material incident scenes until you decontaminate and wash hands, face, and hair thoroughly.**



## Chapter & Lecture Notes:

[illegible]

[illegible]

OSHA's Final Rule - 29 CFR Part 1910.120  
NFPA Standard 472 Chapters 2-2, 2-3, & B-1  
American National Standards Institute  
Government Code 8574.13 (b) (2)

# Hazard Assessment

---

On completion of this chapter, the student will be able to:

1. *Describe the risk* associated with hazardous materials located or transported through the community and their potential threat to people, property, or the environment.
2. *Recognize the hazards* that can be encountered while responding to an incident involving hazardous materials and describe the precautions to be observed when approaching an incident scene.
3. *Demonstrate competency in making an initial risk assessment* to evaluate the hazards presented by an incident scene, determine the level of emergency, and deliver initial condition reports.
4. *Demonstrate the ability to ascertain the immediate concerns* posed to life safety, the environment and property by a hazardous materials incident.
5. *Demonstrate competency in establishing the primary and secondary objectives* that will be required to mitigate a hazardous materials emergency.



## Scope of the Problem

### Livingston, LA

On September 28, 1982, the freight train passing through Livingston, LA derailed. The train derailment, containing 101 cars, began several fires and releasing toxic chemicals. The fires and chemical releases caused the *evacuation of more than 3,000 people for 14 days*.

### Miamisburg, OH

On July 8, 1988, a freight train derailed in Miamisburg, OH. A tank car of phosphorous ignited and the resulting release *caused some 30,000 people* to be evacuated for four days. The local hospital decided to shelter-in-place patients when the fire gas plume enveloped the hospital.

### Henderson, NV

On May 4, 1988, a fire and explosion occurred at the ammonium perchlorate manufacturing plant in Henderson, NV. The devastating explosions that occurred killed two people and measured more than "3" on the *Richter Scale*. The plume of smoke climbed to more than 7,000 feet and caused the evacuation of hundreds of people.

### Bhopal, India

The *accidental release* of the pesticide methyl isocyanate from a manufacturing plant in Bhopal, India killed over 2,000 people and maimed over 20,000 others. The final death toll resulting from this single incident will never be fully known.

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...the first arriving officer at a hazardous materials emergency must be able to make an assessment of the whole situation through use of a systematic **HAZARD ANALYSIS**.

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In this modern technological world, the manufacture, use, storage, and transportation of hazardous materials is dramatically escalating. Naturally, the frequency of emergency incidents involving these substances is also increasing. Spills of motor fuels and unauthorized releases of other products are now becoming a common occurrence. Although they can be very challenging at times, most of these incidents can be handled effectively within the resources of the local response agencies. However, actual case histories have shown us that hazardous materials incidents are also capable of escalating to a magnitude that overwhelm local resources. Additionally, as in the case of the incident in Bhopal, India, they sometimes can prove more of a challenge than even a national government is prepared to handle.

As releases of hazardous gases and liquids have no respect for jurisdictional boundaries, the mitigation of these incidents may

necessitate the interaction of numerous local, state and federal agencies. For instance, a seemingly simple hazardous materials spill originating on a state highway may find its way into a stream bed or other water source and require the intervention of the local fire department, local health department, State Highway Patrol, State Department of Fish and Game and the U.S. Coast Guard.

The effective utilization of the resources needed to mitigate an incident requires the use of a comprehensive management system, such as the **Incident Command System (ICS)**. Furthermore, in order to accommodate the needs of the various agencies and jurisdictions that may be involved with an incident, a **Unified Command Structure** must also be established. This scene management system must be built from the bottom up and expanded as the need arises. Therefore, in order to determine the resource needs, the first arriving officer at a hazardous materials emergency must be able to make an assessment of the entire situation through use of a systematic **hazard analysis**. For purposes of developing a systematic approach, this vital function should be broken down into the following components:

- **Appropriate response to the incident scene**
- **Incident size-up & hazard recognition**
- **Problem identification**
- **Reporting on conditions**
- **Identification of the immediate concerns**
- **Development of initial strategy and tactics**

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...it is imperative that responders be able to recognize the presence of hazardous materials and identify any real or potential problems...

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## Response Considerations

While making an initial response to an emergency incident, it would be wise to remember the old saying that “Fools rush in where angels fear to tread.” Remember, the primary goal of a responder is to effect a solution to the problem and not—through rushing in blindly—become part of the problem. Quite often responses are made to emergencies without the knowledge that hazardous materials are even involved in the incident. Yet these substances could become a major factor in *any* emergency situation. For instance, medical emergencies definitely produce their share of etiological hazards, while vehicle accidents and truck fires certainly could involve hazardous materials. In one incident on record,



firefighting personnel—who believed they were responding to a residence structure fire—were poisoned by toxic fumes when the chemicals being used to fumigate a building activated the smoke alarm. Therefore, it is imperative that responders be able to recognize the presence of hazardous materials and be able to identify any real or potential problems from a safe distance before committing to any direct course of action.

Emergency response to *known* hazardous materials incidents should be made from an **upgrade** and **upwind** direction whenever possible. Probably the best way to provide for a safe response is to **pre-determine** a primary response route while conducting pre-plans of target hazard areas. Secondary response routes should also be pre-determined during pre-planning to allow for modifying conditions, such as changes in wind direction or road blockages. Furthermore, during the actual response to an incident binoculars should be used from a high vantage point such as a highway overpass, or the crest of a hill to examine the conditions surrounding the incident scene from a safe distance.

There are many outward signs that may indicate the presence or involvement of hazardous materials at an incident scene. For example, vapor clouds, fuming chemicals, smoke colors, damage to plant life, obvious injuries to humans and animals, people fleeing from the scene, and even the shape of transportation or storage vessels should offer **clues** to the responder that hazardous substances may be involved. Responders should also be looking for the traditional methods of identification, such as DOT placards on transportation vessels, DOT labels and pesticide labels on containers, or NFPA 704 warning system placards on a fixed facility installations. However, a more in-depth hazard evaluation may have to be delayed or postponed until shipping papers or hazardous materials inventory statements can be obtained from truck drivers or plant managers.

## Basic Hazard Classes

The list of products and chemicals that may be encountered at a hazardous materials emergency is so diverse that at first glance it seems an overwhelming problem. In fact, the list published by the Chemical Abstract Service (CAS) has recently grown to over six million different chemicals. Therefore, in an attempt to simplify the process of depicting what these substances are capable of—in terms of their hazards—these chemicals have been divided into eight basic categories. The following section describes some of the hazards presented by each of these groups.

### UN Class #1 Explosives

An explosive is a substance which undergoes a very rapid oxidation process producing large amounts of rapidly expanding gases and heat. Explosives are subdivided into the following groups: Division 1.1 - Explosives with a mass explosion hazard, Division 1.2 - Explosives with a projection hazard, division 1.3 - Explosives with predominately a fire hazard, Division 1.4 - Explosives with no significant blast hazard, Division 1.5 - Very insensitive explosives; blasting agents, Division 1.6 - Extremely insensitive detonating substances. The very rapid oxidation reaction of explosives can produce fragmentation hazards, ground flashes, enormous fireballs, shockwaves, and in the case of Class A explosives, pressure waves exceeding the speed of sound.

### UN Class #2 Gases

Gases are subdivided into Poison Gases, such as **Hydrogen Cyanide**; Flammable Gases, such as **Acetylene**; and Non-Flammable Gases, such as **Nitrogen**. Gases present a special hazard in that they can travel and reach sensitive areas much more easily than liquids and solids. For instance, poison gases can enter the human body through inhalation and absorption much faster than poison liquids, and there is much more potential for flammable gases to reach ignition sources than for flammable liquids.

### UN Class #3 Flammable & Combustible Liquids

Flammable liquids, such as **Gasoline**, are liquids that have a flash point below 140° F. The flash point is the temperature at which sufficient flammable vapors are given off from the liquid to form an ignitable mixture with air. Combustible liquids on the other hand, such as **Kerosene**, have flash points above 140° F and therefore require preheating before they form ignitable mixtures. The main danger with flammable and combustible liquids is that they can ignite and burn with an extremely high output of heat, and they are mobile in that they can flow to other areas producing much damage and destruction.

### UN Class #4 Flammable Solids

Flammable solids can be subdivided into solid compounds that can be readily ignited, such as **Red Phosphorus**, and solid substances which are dangerous when wet, such as **Sodium Hydride**. The obvious danger presented to firefighters by the latter group is that water is the most common medium used to extinguish fires. Therefore, it is vital for responders to **identify** the actual hazard class of the materials involved in an incident before committing to any direct course of action.

### UN Class #5 Oxidizers

Oxidizers are substances that can support combustion or can readily yield oxygen. In the case of the highly reactive **Organic Peroxides** they can also be extremely flammable and explosive. The **instability** of these materials produces a very real danger to responders in terms of their reactivity and incompatibility with other compounds. Therefore, *incidents involving these materials should be handled just as if they were true explosives.*

### UN Class #6 Poison Liquids, Solids

Although poisonous liquids and solids are not as mobile as the poison gases, they are extremely dangerous in terms of their **toxicity** which can cause local or systemic effects in an organism. Exposure to such materials does not always result in death, although that must always be a primary concern for emergency responders. The actual effect on an organism depends not only on the inherent toxicity of the material itself, but also on the **magnitude** of the exposure (acute or chronic) and on the **route** of exposure (inhalation, absorption, ingestion, injection).



## UN Class #7 Radioactives

Radioactive materials that may be encountered at an incident can emit three types of harmful radiation: **Alpha** particles, **Beta** particles, and **Gamma** waves. All three types can harm living organisms by imparting energy which ionizes molecules in the cells, causing cellular dysfunction and even death. As radiation has no warning properties, such as smell, taste, or irritation, responders must be able to detect the presence of these substances with radiation survey instruments.

## UN Class #8 Corrosives

Corrosives are defined as substances that cause destruction to human tissue or cause a severe corrosion rate on steel. These substances can be subdivided into *acids*, which yield hydrogen ions, and *bases*, which yield hydroxide ions. Acids can again be subdivided into the **organic acids**, which are flammable and sometimes explosive, and **inorganic acids** which are strong oxidizers. Therefore, emergency responders must not only consider the harmful toxic and corrosive effects of these materials, they must also be very aware of the flammability and oxidation potential presented by these substances as well.

## UN Class #9 Miscellaneous

Any material which presents a hazard during transportation but which does not meet the definition of any other hazard class. Class 9 includes materials which have anesthetic, noxious or similar properties which could impair the ability of flight crews, materials shipped at elevated temperatures, hazardous substances, some hazardous wastes and materials listed by the EPA as marine pollutants.

## Establishing Initial Command Post

On arrival at the incident scene, the first arriving officer must establish an initial command post. Later, when more resources arrive, a more permanent command post can be established in a larger and more remote location. This initial command post should be established in a safe location, upwind and upgrade from the incident. It should afford the first-in Officer an overall view of the incident from which to conduct the size-up process and hazard appraisal. Response apparatus should be positioned **pointed away from the incident** so a strategic relocation (fast retreat) can be made from the incident scene if conditions surrounding the incident become untenable.

## Incident Size-up

While evaluating the emergency incident scene, certain factors must be systematically analyzed. This process - known as "**size-up**" is basically a systematic appraisal of the conditions surrounding the incident scene. Size-up should be started as soon as a response to an incident is initiated and should continue on an on-going basis throughout the whole emergency.

The factors that should be evaluated during the size-up process fall into the following categories: 1) **Facts**, in other words, what is known about the incident; 2) **Probabilities**, or what is probably going to happen; 3) **Possibilities**, what could possibly happen; and 4) **Situation** of the responder, such as what resources are readily available etc.

### Facts

Consider what is actually known.

- What is the time of day and day of the week? (weekday, weekend, rush hour, etc.)
- In what kind of area is the incident occurring? (industrial, residential, commercial, etc.)
- What is the nature of the emergency? (explosion, fire, leak, spill, etc.)
- Are there any life-hazards present? (number and type of people, i.e. ambulatory, non-ambulatory etc.)
- Are there any environmental or property exposures?
- What type of buildings are involved (occupancy, construction, size, etc.)
- What products are involved? (amounts, hazard class types)
- What type of containers are involved? (pressurized, non-pressure, transportation, storage, etc.)
- What is happening to the incident at this time? (Where is spill going. How is fire developing?)



- What are the present weather conditions? (wind, rain, heat, humidity, atmospheric inversion, etc.)
- What is the topography of the area? (direction of grade, steepness of slope, storm drains, sewer systems, etc.)

**Probabilities & Possibilities**

Consider the things that will probably happen, or could possibly happen.

- Could fire extend to other building or exposures?
- Could leaks or spills travel to low areas?
- Are vapor clouds likely to travel downwind?
- What is the likelihood of an explosion?
- What is the probability or possibility of a building collapse?
- Are changes in weather conditions likely?
- What will be the effects of natural stabilization?

**Situation**

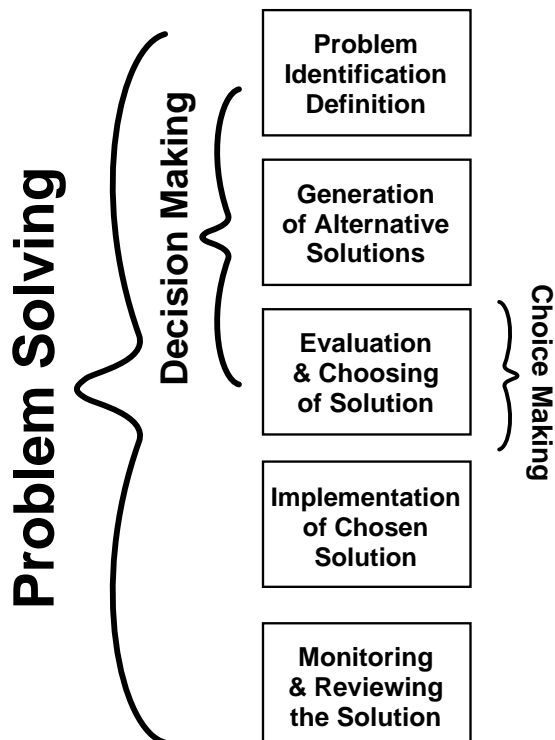
Consider your own situation and what resources are readily available.

- What units are responding at this time? (apparatus, equipment, manpower, etc.)
- What additional units will be needed? (fire, police, ambulance, public works, etc.)
- What specialized equipment or resources will be needed? (trucks, front-end loaders, firefighting foam, haz/mat response teams, diking or absorbent materials, etc.)
- Who will need to be notified? (local, state & federal agencies)

## Problem Identification and Decision Making

The enormous responsibility of mitigating a major hazardous materials incident may at first glance seem overwhelming to any Incident Commander. However, when the formidable resources of the fire service—such as manpower, equipment, and specialized expertise—are fully analyzed, it becomes apparent that the Incident Commander actually has at his or her disposal the wherewithal to effectively handle the situation. Using the synergism of his or her own experience and education and the history of what has happened in previous similar incidents, it is the *role* of the Incident Commander to make a careful evaluation of the situation, determine alternative solutions and implement a course of corrective action. This process is referred to as “decision making.”

The term **decision making** can be best described as the process through which a particular course of action is chosen. Whereas, **problem solving** encompasses the whole process of reducing the difference between the actual situation and the desired situation. The following chart illustrates the difference between choice making, decision making, and problem solving.



### A Systems Approach

As with any emergency situation, important command decisions at hazardous materials incidents shouldn't be made haphazardly or without forethought. Unfortunately, some of these incidents can escalate to such a severe magnitude, in terms of logistics, geographical parameters and time factors, that the Incident Commander can be overwhelmed into making irrational decisions. Therefore, to ensure that logical thought patterns are not abandoned, it is imperative that the Commander use some form of a system in the mental process of making decisions. The following six-step process is commonly used as a systems approach to decision making in business management. However, the very same system can be equally useful to the incident commander on the fireground.

## Step 1: Identify and Define the Problem

This is probably the most vital step in the whole problem solving process. The over-all nature of the problem must be determined before appropriate solutions can be generated. Unfortunately, there is a tendency for Commanders to diagnose a problem in terms of its **symptoms**, or to focus on narrow, lower order goals and objectives. This tendency, which is commonly known as “**tunnel vision**” can often cause the minor issues to receive all of the incident commander’s attention, while the real problem is ignored or neglected. For instance, a Fire Officer arriving at a pesticide facility may determine the problem to be centered on the extinguishment of the blaze only. The amount and type of poisonous substances contained in the facility may be the **real issue** presented by this incident. Obviously, the danger of contaminating the run-off water from fire streams may prohibit the use of regular firefighting procedures.

## Step 2: Systematically Examine the Conditions Surrounding the Problem

This systematic appraisal of the conditions surrounding a problem is commonly known in the Fire Service as “**Size-up.**” This mental review process should include the following elements: the **facts** of what is known about the incident, the **probabilities** of what could happen, the **possibilities** of something happening, and the **situation** of the units on scene. It would be correct to say that size-up should be initiated as part of pre-emergency planning, or at least started as soon as an alarm is received from dispatch. The process must also be continued on an on-going basis throughout the whole incident.

In the example of the pesticide storage fire, a systematic size-up would make the discovery that the real problem isn’t centered on **property conservation** and the extinguishment of fire, but is more concerned with **exposure** protection and **environmental** issues.

### Step 3: Generate Alternative Solutions

This step in the process is used to identify the actions that could reduce, or eliminate, the difference between the actual situation and the desired situation. In other words, incident commanders want to generate alternative solutions to the problem. To supplement their own education and experience, incident commanders can make use of the old-fashioned technique of “**brainstorming**” with the other members of their staff to avoid limiting the number of alternative solutions from which to choose. In the example of the pesticide storage fire incident, the three following alternative solutions could be quickly generated:

1. Extinguish the fire with fire streams
2. Extinguish the fire with High Expansion Foam (if available)
3. Protect exposures and allow the fire to burn out (controlled burn)

### Step 4: Evaluate the Alternatives and Select the Most Conspicuous Option

To establish the criteria by which the various alternatives should be judged, primary consideration should be given to the basic mission of the Fire Service. The incident commander should consider the full implications and consequences inferred by each of the alternatives. Then the option should be selected that will not only serve to accomplish the task, but will also maintain the integrity of the three-part mission of the Fire Service. The three alternative actions generated for the pesticide fire example could be evaluated in the following manner:

#### EXTINGUISH THE FIRE WITH MASTER FIRE STREAMS

##### Advantages:

Time could be saved and property could be conserved by using this tactic. However, just how much of the building and contents will be of future use is very questionable.

##### Disadvantages:

The amount of water required to bring the fire under control, and the toxicity of the products involved, would create an enormous amount of contaminated run-off water. If this run-off water cannot be contained it could severely damage the environment and pollute underground water tables. Cooling the fire could also cause an

increase in the toxicity of the smoke and fire gases, thereby increasing the life and health risks to the public and emergency personnel. Also, because of the spread of poisonous materials, the clean-up costs following the incident would be enormous.

### EXTINGUISH THE FIRE WITH HIGH EXPANSION FOAM

**Advantages:**

The water run-off will be drastically reduced by using High Expansion Foam and damage to the environment will be minimized.

**Disadvantages:**

The use of this tactic requires specialized foam products and application equipment which may not be available to all fire officers. Moreover, the clean-up after the incident will not only be very difficult and time consuming to perform, but also very expensive.

### PROTECT EXPOSURES AND ALLOW THE FIRE TO BURN-OUT

**Advantages:**

As no water is required for this tactic, there will be no run-off water to contain. Also, if the fire is allowed to reach at least 1800°F, the toxicity of the smoke and fire gases will be drastically reduced, thereby decreasing the health risks. The damage to the environment and the clean-up costs following the incident will also be minimal.

**Disadvantages:**

Adjacent exposures will have to be protected, which may include the need for local evacuation of the public. This tactic may not be readily understood by lay people, the media, or even members of the Fire Service. Therefore, it is imperative that the incident commander appoint an Information Officer to properly inform all concerned of what the emergency personnel are actually doing.

*Once these alternatives have been analyzed, it becomes fairly obvious which one is the most conspicuous option.*

### **Step 5: Implement the Decision in a Plan of Action**

This is the step in the process where the actual tactics necessary to achieve the pre-determined goals and objectives are deployed. In the example of the pesticide fire, if the decision was made to allow the fire to burn-out, it may be necessary to isolate the area and deny entry, initiate localized evacuation downwind and notify the appropriate agencies, such as the air pollution control board and the environmental health department.

### **Step 6: Evaluate the Progress**

If the chosen solution isn't working, the incident commander must be prepared to recover from error and attempt to resolve the problem another way. It is easy to become "**locked-in**" on a tactic that should have worked but unfortunately, didn't. Don't be trapped into sticking with a certain course of action, just because it seemed like a good idea at the time.



### GUIDELINES FOR MAKING DECISIONS AND ISSUING ORDERS

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1. Mentally focus on the **total** situation and quickly evaluate the facts, probabilities and your own situation.
2. Avoid **over-reacting** and giving orders prematurely.
3. Be as objective as possible. Don't let the problem **intimidate** you.
4. Use a **report** on conditions to help you clarify your own thoughts and to fully appraise others of the situation.
5. Don't rely on memory alone. Use all of the **resources** available to you, such as pre-plans, maps and response books.
6. Be **professional** while issuing orders. Don't shout or use profanity; it creates a false sense of urgency.
7. **Adhere** to the chain-of-command and span-of-control. Don't be afraid to delegate responsibility.
8. **Monitor** progress and watch out for modifying conditions.
9. Regroup as often as necessary and don't be afraid to admit mistakes and **recover from error**.

As previously mentioned, there are many traditional methods used to indicate the presence of hazardous material at an incident. Furthermore, there are some warning systems, such as **DOT placards** and labels and **NFPA 704 placards**, that actually identify the particular hazard class, or classes, present at an emergency. However, due to the limitations of these systems, responders should attempt to obtain transportation **shipping papers**, or fixed facility **inventory statements**, to find out exactly what chemicals are involved. After obtaining these documents, and before any in-depth incident mitigation or remedial actions is initiated, responders need to consult *more detailed and specific information* regarding the actual products. The various sources available to responders generally fall into one of the following four categories:

- 1 **Chemical Reference Books**
- 2 **Emergency Information Telephone Services**
- 3 **Computerized Chemical Data Bases**
- 4 **Direct on-scene advice from expert sources**

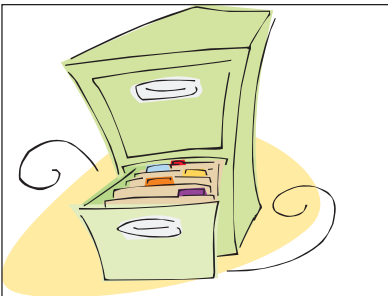
The information provided by just one of these sources may not be as specific, complete, or comprehensive as is needed by on-scene personnel. Therefore, it is recommended that at least *three* different sources of information be consulted before a plan of action is actually developed and implemented.

All emergency response apparatus are required to carry the Department of Transportation Emergency Response Guidebook (**DOT ERG**). This book provides a guide for initial actions at emergencies involving hazardous materials in *transportation*. However, it is important to remember that the guide is *not* intended to cover incidents occurring at fixed facility installations, and is *not* a panacea for all emergency situations. However, the guidebook does have its uses, even if only as a starting place in the search for further information. For instance, the United Nations four-digit identification number found on some DOT placards can be looked up in the guidebook in order to find the actual name of the product.

Computerized chemical data bases are now being commonly used and carried by Hazardous Materials Response Teams. One such data base is the Computer Aided Management of Emergency Operations (CAMEO) system developed by the National Oceanic and Atmospheric Administration (NOAA). This system contains a “code breaker” component designed in such a way that a request for information can be initiated by inputting the chemical name, synonym, or identification number into the program’s search field. A response information data sheet can be printed that provides the following information: general description, physical properties, fire hazards, spill control measures, health hazards, first aid procedures, and protective clothing requirements. An example of a CAMEO response information data sheet for the chemical Ethylene Oxide is shown on the next two pages.

## RESOURCE CATEGORIES

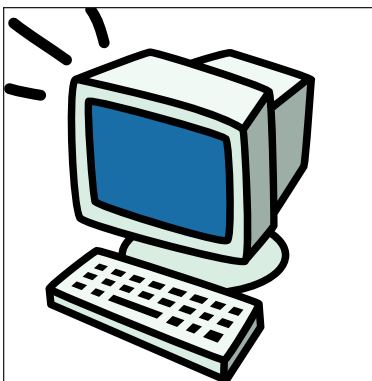
1



2



3



4



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**HAZARDOUS MATERIALS ON-SCENE  
INCIDENT COMMANDER**

CAMEO Response Information Data Sheet, Version 2.0  
NOAA — 7600 San Point Way N.E., Seattle, WA 98115 (206) 526-6317

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**ETHYLENE OXIDE**

CAS Number 75218  
**NFPA Degrees of Hazard**  
Health: 2  
Flammability: 4  
Reactivity: 3  
Special:

**GENERAL DESCRIPTION**

Ethylene oxide is a clear, colorless, volatile liquid with an ethereal odor. It is used to make other chemicals, as a fumigant and industrial sterilant. It has a flash point of less than 0. degrees F., and is flammable over a wide vapor-air concentration range. The material has to be diluted on the order of 24 to 1 with water before the liquid loses its flammability. If contaminated it may polymerize violently with evolution of heat and rupture of its container. The vapors may burn inside a container. The vapors are irritating to the eyes, skin, and respiratory system. Prolonged contact with the skin may result in delayed burns. It is lighter than water and soluble in water. The vapors are heavier than air. ([C]AAR, 1986).

**FIRE HAZARDS**

Severe explosion hazard when exposed to heat or flame. Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. Vapor forms explosive mixtures with air over a wide range. Liquid is not detonable but the vapor may be readily initiated into explosive decomposition. Avoid contact with air, heat, acids and bases; metal or metal chloride catalysts; covalent halides such as chlorides of aluminum, iron (iii), tin (iv); basic materials like alkali hydrides, ammonia, amines, and potassium; catalytically active solids such as aluminum or iron oxides or rust; some carbonates; and metals such as copper and copper alloys. Hazardous polymerization reaction may occur. Incompatible with metal fittings containing silver, mercury or magnesium; pharmaceutical substances; vitamins; amino acids; food constituents; oxidizing agents; organic bases; certain salts; alcohols; mercaptans; magnesium perchlorate; M-nitroaniline; trimethylamine; potassium chloride; contaminants; alkanethiols; bromoethane. decomposition products are explosive. Irritating vapors are generated when heated. (EPA, 1986).

**FIRE FIGHTING**

Extinguish with alcohol foam, carbon dioxide, dry chemical or water spray, fog, or foam. Let burn unless leak can be stopped immediately. Move container from fire area if you can do so without risk. Stay away from ends of tanks. Fight fire from maximum distance. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire. (EPA, 1986).

**PROTECTIVE CLOTHING**

Wear positive pressure breathing apparatus and full protective clothing. Wear proper eye protection. (EPA, 1986).

Butyl: Good Resistance/Limited Data.  
Chlorobutyl:  
Chlor Rub:  
CPE: Good Resistance/Limited Data  
CP 39:  
EVA PE:  
FEP TFE:  
Hypalon:  
NBR:  
Neoprene: Poor Resistance/Limited Data.  
Neo Rub:  
Neoprene SBR:

CAMEO Response Information Data Sheet, Version 2.0  
ETHYLENE OXIDE, continued

Nitrile: Good Resistance/Limited Data.  
Nitrile PVC:  
PE:  
Polycarb:  
PU:  
PVA:  
PVC: Poor Resistance/Limited Data.  
Rubber: Poor Resistance/Limited Data.  
Rub Neo NBR:  
Rub NEO SBR:  
Saranex:  
SBR:  
Viton: Poor Resistance/Limited Data.  
Viton Neo:

**HEALTH HAZARDS**

It can cause death. Low toxic concentration when inhaled is 12500 ppm/10 seconds. It is a strong skin irritant. Neurological disorders and even death have been reported. Signs and Symptoms of Exposure: low vapor concentration often results in delayed nausea and vomiting. Higher concentration produces irritation of eyes, nose and throat. (EPA, 1986).

**NON-FIRE RESPONSE**

Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without hazard. Use water spray to disperse vapors and dilute standing pools of liquid. ([C]AAR, 1986).

**FIRST AID**

Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation. (EPA, 1986).

**PROPERTIES**

Flash Point: >0.4 degrees F unspecified. Greater than -18C (EPA, 1986)  
Lower Exp. Limit: 3% (EPA, 1986)  
Upper Exp Limit: 100% (EPA, 1986)  
Auto Igtn Temp: 804 degrees F (USCG, 1985)  
Vapor Pressure: 1095 mm Hg @ 68 degrees F (EPA, 1986)  
Vapor Density: 1.49 (EPA, 1986)  
Specific Gravity, Liquid: 0.8222 @ 50 degrees F (EPA, 1986)  
Specific Gravity, Solid:  
Boiling Point: 51.3 degrees F (EPA, 1986)  
Molecular Weight: 44.06 (EPA, 1986)  
IDLH: Not applicable, potential human carcinogen (NIOSH, 1987)  
TLV TWA: 1 ppm ([C]ACGIH, 1986)  
TLV STEL:

## Immediate Concerns & Primary Objectives

From the size-up and hazard evaluation process, the Incident Commander should be able to determine the *immediate concerns* presented by an incident and be able to specify exactly what *primary objectives* should be established in order to abate the emergency. In other words, what is the present and immediate danger to people, property, and environment, and what action steps can be taken to mitigate these hazards?

### Immediate Concerns

Immediate concerns are the *strategic* plans focused on *stabilizing* the emergency and the initiation of *preventive* measures with the available resources at the scene. For instance, the immediate concern presented by a fire involving explosives would be to protect life safety. For the release of a flammable gas, the immediate concern would be to prevent ignition.

#### Examples:

- Protecting life safety, or preventing further loss of life
- Protecting the environment, or preventing further pollution
- Protecting exposures, or preventing further property damage
- Preventing ignition, explosion, or spread of fire
- Preventing spread, or further spread, of spilled materials
- Maintaining the separation of incompatible materials

### Primary Objectives

Primary objectives are the *tactical* actions that responders can accomplish safely in order to *execute* the basic strategic plan. For instance, for a fire involving explosives the primary objectives would be to isolate the area, deny entry, and withdraw firefighting forces. The primary objective in the event of a release of a flammable gas, would be to eliminate ignition sources and stop the flow of product.

**Examples:**

- Isolate the incident scene and deny entry
- Attempt to classify or I.D. the product
- Evacuate the immediate vicinity and areas downwind
- Stop product flow, or contain spilled materials
- Eliminate ignition sources or production of vapors
- Contain and extinguish fire
- Accept control burn and protect exposures
- Cool exposure containers, buildings, and other property
- Separate or remove incompatible materials
- Notify local, state and federal agencies
- Request specialized assistance
- Request special materials

**Secondary Objectives**

Secondary objectives are those actions required to *further mitigate* the hazards presented by an incident, *initiate remedial steps*, and the restoration of normal services. These secondary objectives should be considered to be just as important as primary objectives. However, due to time constraints and other logistical problems, the execution of these actions may be *delayed*.

**Examples:**

- Overhauling of fires
- Removal of spilled materials
- Disposal of hazardous wastes
- Cleaning-up of incident scene
- Investigation of incident cause
- Prosecution of responsible parties

---

**Immediate concerns** are the *strategic plans* focused on stabilizing the emergency and the initiation of preventive measures with the available resources at the scene...

**Primary objectives** are the *tactical actions* that responders can accomplish safely in order to execute the basic strategic plan.

---

## Determining Level of Incident

Determining the level of the incident can assist the Incident Commander in determining their needed resources. Graduating from Level I (least serious) to Level III (most serious), the magnitude of the emergency will determine the extent of involvement from local, state and federal agencies. From the initial size-up, an incident commander must be able to determine the level of emergency.

### Level One Incident

Level I emergencies are those *minor incidents* that can be correctly contained, extinguished, and/or abated utilizing equipment, supplies and resources immediately available to first responders having jurisdiction and whose qualifications are limited to and do not exceed the scope of training as explained in Title 8 CCR 5192, or the California Government Code Chapter 1503, with reference to "First Responder, Operational Level".

### Level Two Incident

These incidents are *more complex*, which can only be identified, tested sampled, contained, extinguished, and/or abated utilizing the resources of a Hazardous Materials Response Team, which requires the use of specialized chemical protective clothing, and whose qualifications are explained in Title 8 CCR 5192, or the California Government Code, Chapter 1503, with reference to "Hazardous Materials Technician Level".

### Level Three Incident

A Level Three emergency is a *major incident* that has escalated beyond the capabilities of local Hazardous Materials Response Team. A Level Three emergency requires the intervention of state and federal agencies, such as the EPA. These are the "worst case scenarios," such as a major train derailment or an airplane crash, and require the establishment of a **unified command** structure and scene management system. Level Three incidents require mandatory reporting to the **National Response Center** (1-800-424-8802).



## Determining Reportable Quantities

While attempting to determine if a hazardous materials spill qualifies as a reportable quantity or not, an Incident Commander has two options. If the size of the spill equals or is more than the established and published RQ for that particular substance, then it must be reported as such. However, if the size of the spill cannot be determined but the size of the container that the material was released from equals the RQ for that substance, then Incident Commander must report the incident. Any leaking container with a capacity equal to or exceeding an RQ, should be reported.

## Initial Report on Conditions

It is vital that the first-in Officer transmit a brief radio message giving a report on conditions, immediately upon arrival at the scene of an emergency. It is not intended that this report be a completely detailed hazard assessment. Instead, the report should be used to describe the conditions initially encountered in order to provide pertinent data to the communications center and the other incoming units. The components of this report—which serves as an essential “umbilical cord” for all the responding units—can be memorized by using the acronym “OCAA.”

**OBJECT**

Give a description of **objects** involved in the incident

**CONDITION**

Describe the **conditions** surrounding the incident

**ACTION**

Announce what **actions** you are taking

**ASSIGNMENT**

Give **assignments** to other units



## Example

“Engine 1 is on the scene of an overturned cargo tanker, **(OBJECT)** Northbound Highway 1 at the 7th Street off-ramp. The tanker has a Flammable Liquid placard displaying the number 1203 and is blocking both Northbound lanes **(CONDITION)**. I am isolating the incident from the Northbound direction, and am attempting to identify the product **(ACTION)**. Engine 2, continue your response Southbound and establish Command **(ASSIGNMENT)**.”

## Group Exercise Session #1

The following guided group exercises are intended to reenforce the main points presented in the text and to provide the student with the opportunity to apply hazard analysis techniques to a given situation.

This exercise features two imaginary hazardous materials incidents occurring in the non-existent City of Santa Luisa. The first incident scenario has been completed in full to demonstrate what is to be expected from the student. The second scenario centers on an emergency incident that will be used throughout the course for each of the guided group exercises.

Take the incident only as far as conducting the basic hazard assessment and making the initial condition report. The more in-depth mitigation operations needed for these scenerios will be covered in a later section.

This exercise is to be completed in a study group format using a map of Santa Luisa and the resources provided by the instructor. At the conclusion of the session, a five (5) minute presentation containing an overview of the group's findings will be delivered by a representative from each of the groups.

## **Scenario #1**

On arrival at the Exhibit Buildings on Gaviota Street, Engine #1 encounters heavy smoke and flame coming from the windows and open door of the Acme Pest Control Company (Building #4). The office manager informs the first arriving officer that Buildings #3 and #4 have been evacuated. The fire building is a single story, tilt-up construction with a tar and gravel roof. The fire department's pre-plan of the building shows that normally the contents include Methyl Bromide and Chloropicrin gases, liquid Parathion, Diazinon dust, and fertilizer grade Ammonium Nitrate. It is 1100 hours on Monday July 12, conditions are dry with temperatures in the 70s. The wind is traveling at 4 mph in the direction shown on the accompanying run-map.

### **Initial responding units:**

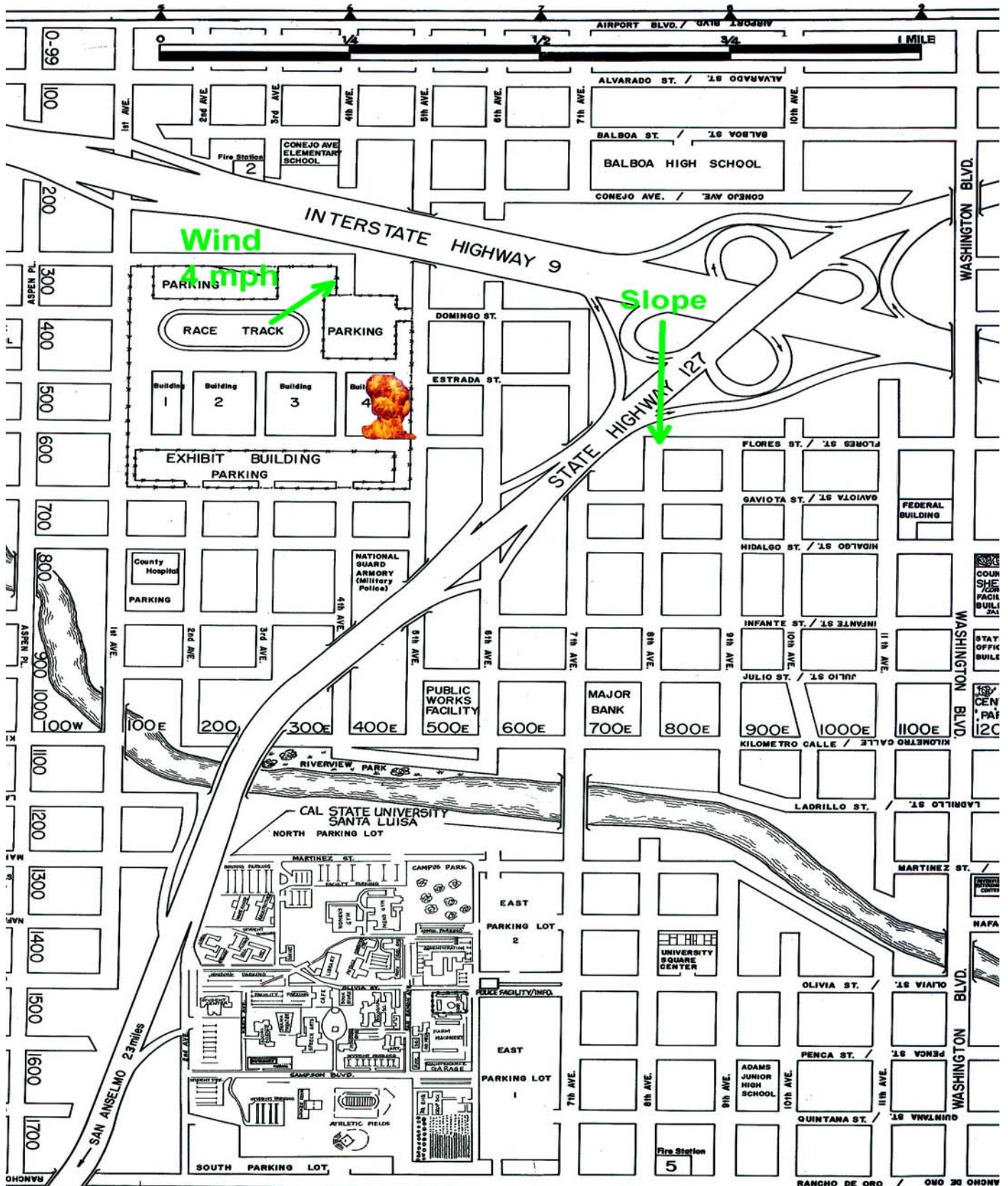
Engine #1, Engine #2, Truck #3, and Battalion Chief #1 (first-alarm assignment)

### **Each additional alarm assignment includes:**

In Santa Luisa, each additional alarm includes two Engine companies, one truck company, and one Battalion Chief.

*Using the references sources provided and the check sheets on the following pages, complete an initial hazard analysis of the given situation.*





## HAZARD ASSESSMENT CHECK SHEET

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### Primary Response Route

West on Julio - North on 5th - West on Gaviota to parking lot

### Initial Command Post

Exhibit Buildings parking lot on Gaviota Street

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## Size-Up

### *Facts*

|                                  |                                                                      |
|----------------------------------|----------------------------------------------------------------------|
| <b>Conditions:</b>               | 1100 hours, Monday, July 12, low humidity, 70° F, Wind N.E.<br>4 mph |
| <b>Nature of Emergency:</b>      | Well involved fire in a single story commercial building             |
| <b>Building:</b>                 | Single story commercial, tilt-up construction, tar & gravel roof     |
| <b>Contents:</b>                 | Poison liquids, gases & powders, flammable liquids, & oxidizers      |
| <b>Exposed Property (fire):</b>  | Building #3                                                          |
| <b>Exposed Property (smoke):</b> | Interstate 9, Conego School, residences down-wind                    |
| <b>Environmental Exposures:</b>  | Storm drains, sewer system, & Santa Luisa River                      |
| <b>Level of Incident:</b>        | Level II                                                             |

### *Probabilities & Possibilities*

Fire could extend to building #3  
Poisonous smoke could travel down-wind to exposures  
Flammable liquid containers could explode  
Change in weather conditions is unlikely  
Firefighting water run-off could pollute water tables & river  
Very minimal property conservation to be expected

### *Situation*

|                          |                                                                     |
|--------------------------|---------------------------------------------------------------------|
| <b>Units responding:</b> | Two Engines, one Truck, one Battalion Chief                         |
| <b>Units needed:</b>     | Two additional alarms. Highway Patrol, police, ambulance<br>standby |
| <b>Need to notify:</b>   | Local Health Dept, State OES, Air Pollution Control                 |



# HAZARD ASSESSMENT CHECK SHEET

Hazard Assessment Check Sheet page 2

## Hazard Analysis

**Immediate Concerns**

- Reduce threat to life and health from poisons and explosions.
- Protect environment from further damage
- Prevent fire spread to exposed buildings
- Prevent run-off of contaminated water

**Primary Objectives**

- Establish Command and control scene
- Isolate incident and deny entry
- Request additional units
- Protect exposures

**Secondary Analysis**

- Notify appropriate agencies
- Evacuate downwind areas
- Gain positive I.D. of products involved
- Determine campaign-mode incident action plan

## Condition Report

"Engine #1 is on the scene at Acme Pest Control Building #4. This is a working fire at a single story commercial unit. All incoming units, be advised the fire building contains pesticides. Engine #1 is establishing command. Engine two, lay a supply line to Engine #1 on the South side of Building #4. All other units stage at the Exhibit Building Parking Lot.

## **Scenario #2**

For the purposes of this exercise you are asked to role-play as the Company Officer assigned to Engine #1. It is 1030 hours on Tuesday March 13, conditions are overcast with temperatures in the 50s. The wind is traveling North at 4 m.p.h.. Engine #1 is in service conducting district familiarization and at this time is located at Martin Luther King Park (24th Ave. and Kilometro Calle). Meanwhile, the rest of the first alarm assignment for this district, Engine #2, Truck #3, and Battalion Chief #1, are conducting a training session at Nafarrate High School (22nd Ave. and Olivia Street).

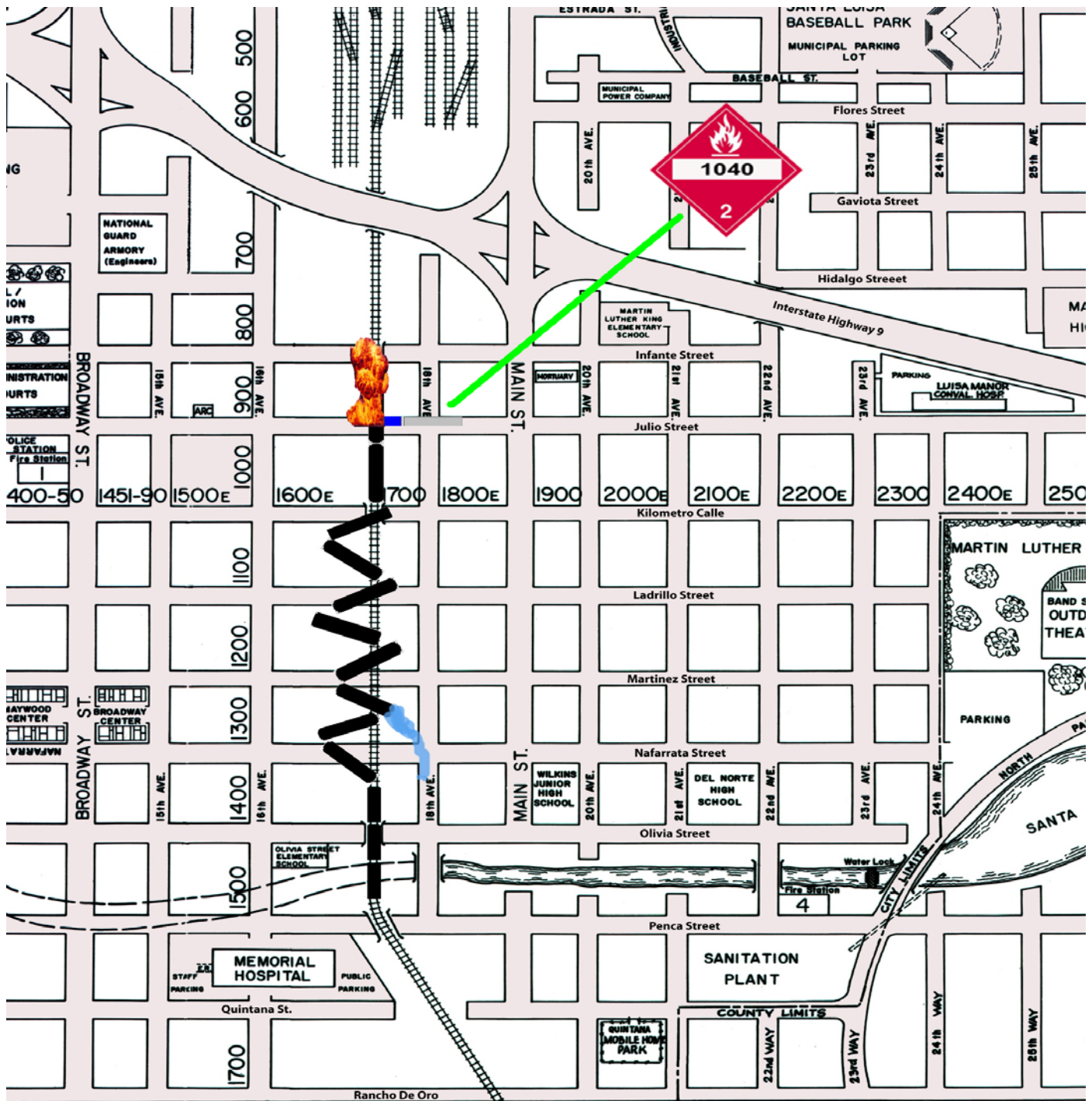
At 1035 hours Engine #1, Engine #2, Truck #3, and Battalion Chief #1 are dispatched as a first alarm assignment to a vehicle vs. train at the railroad crossing on Julio Street. Cross streets are Infante and Kilometro Calle. Due to its present location at the Park, Engine #1 will be the first-arriving fire unit.

On arrival at Julio Street and the railroad tracks you discover that an MC 331 series highway tank truck placarded UN #1040 has been struck by a Northbound freight train. The diesel fuel tank of the locomotive is on fire, and flames are impinging on the highway truck's cargo container. Communications informs you that the accident occurred two minutes previous to the time of your dispatch. While you are conducting size-up of the incident scene at Julio Street, a member of the train crew informs you that several rail tank cars have derailed and that one of these is leaking liquid product down 18th Avenue into the storm drain mid-block between Nafarrate Street and Olivia Street. Your only immediate reference source is the Emergency Response Guidebook (ERG)

Using the following resources: the ERG, the map of Santa Luisa, the check sheets provided on the following pages, and using the limited information that has been provided to you at this time, complete an initial hazard analysis of the given situation. Utilizing the format of the example presented on pages 26 through 29, your hazard analysis should be divided into the following three parts:

1. Size-up the incident scene and determine the following:
  - Facts
  - Probabilities
  - Possibilities
  - Own situation
2. List in general terms what you have identified as the incident's:
  - Immediate Concerns
  - Primary Objectives
  - Secondary Objectives





3. Give a condition report to the other incoming units.

- \* Additional information regarding this particular incident scenario will be provided later in this course for the purposes of developing a much more in-depth incident action plan. Therefore, limit your hazard analysis only to those aspects that can be expected to be encountered initially by the first-arriving engine company.

# HAZARD ASSESSMENT CHECK SHEET

**Primary Response Route**

**Initial Command Post**

**Size-Up**

**Facts**

**Probabilities & Possibilities**

**Situation**

**HAZARD ASSESSMENT  
CHECK SHEET**

Hazard Assessment Check Sheet page 2

**Hazard Analysis**

**IMMEDIATE CONCERNS**

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**PRIMARY OBJECTIVES**

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**SECONDARY OBJECTIVES**

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**CONDITION REPORT**

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[illegible]

## CHAPTER & LECTURE NOTES:

[illegible]

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[illegible]

OSHA's Final Rule - 29 CFR 1910.120  
Basic Orientation - ICS 220  
Hazardous Materials Module - ICS 222  
NFPA Standard 472 & 471  
American National Standards Institute

# Incident Command System

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On completion of this chapter the student will be able to:

1. *Describe* the historical background of the Incident Command System and describe the need for ICS at incidents involving hazardous materials.
2. *Describe* the role of the Incident Commander, citing the commander's major duties and responsibilities.
3. *Identify* the five major functional areas of the Incident Command Structure.
4. *Distinguish and differentiate* between Branches, Divisions, Groups and Teams.
5. *Describe* the functions of the Haz/Mat Group Supervisor, Site Control Team, Entry Team, Decontamination Team and Assistant Safety Officer - Haz/Mat.

## **Background**

In the Hazard Assessment Section of this course it was stated that hazardous material incidents are capable of escalating to a magnitude that can overwhelm local, and even State resource capabilities. Moreover, as releases of hazardous substances have no respect for jurisdictional boundaries—or even for areas of situational responsibility—even the minor incidents that can be handled effectively within the resources of first responders can also end up involving many different agencies.

The operational problems that can occur in situations where many different agencies are attempting to manage an incident can be enormous. For instance, the lack of an integrated communications network, and the deficit of not using common terminology, can definitely cause many misunderstandings to occur—not to mention the duplication of effort. The shortcoming of not establishing a unified command structure, and not having a pre-determined chain-of-command, can lead to the type of intra-agency conflicts and arguments that will only result in a totally inefficient mode of operations.

As more than one agency can be actively involved in the mitigation of the same incident, a comprehensive management system must be established to ensure the effectiveness of operations. This system is essential in effectively utilizing the resources of all the responding agencies, and also accommodating the diverse areas of responsibility that have been assigned to various agencies. The management system must be able to provide for the following kinds of operation:

1. Incidents occurring in a single jurisdiction involving a single agency.
2. Incidents occurring in a single jurisdiction with multi-agency involvement.
3. Incidents occurring in, or effecting, multiple jurisdictions with multi-agency involvement.

The system's structure should be adaptable to any type of emergency incident, and be acceptable to uses throughout the country. It also should be expanded in a logical manner from an initial attack situation into a major incident.





## ICS & NIMS

The Incident Command System originated after federal, state, county, and city firefighting resources were severely tested by a series of disastrous wildland fires in Southern California in the 1970s. The *multi-jurisdictional* operations required to bring these fires under control identified the need for a management system that would incorporate standardized structure, terminology and communications. In the aftermath of these disasters, the federal government funded a grant for the development of a standardized emergency management system which could be adaptable to all types of emergencies. It was intended for the system to be used for day-to-day incidents as well as for the major, more complex, incidents. To coordinate the development effort to create such a management system, a coalition was formed between the following six agencies: the U.S. Forest Service, the California Department of Forestry, LA County Fire Department, LA City Fire Department, Santa Barbara County Fire Department, and Ventura County Fire Department. This project—known as **FIREScope** (**F**irefighting **R**esources of **S**outhern **C**alifornia **O**rganized for **P**otential **E**mergencies)—established the foundation for the development of the **Incident Command System (ICS)**.

The United States Fire Administration and the National Fire Academy initiated the drive to make ICS a national emergency management system, and, with certain modifications, ICS became the on-scene management structure of the **National Incident Management System (NIMS)**.

NIMS, is a total-systems approach to all-risk incident management, is comprised of the following five major sub-systems:

- 1) An on-scene management structure known as the Incident Command System (ICS), which includes eight interactive components and procedures.
- 2) Standardized training to ensure the efficient operation of the ICS and NIMS.
- 3) A qualifications process—generally known as the National Inter-Agency Fire Qualifications System (NIFQS)—to qualify and certify personnel in the requirements necessary for the specific positions in the ICS.

- 4) A sub-system to develop, publish, and distribute NIMS materials.
- 5) A support sub-system to improve the utilization of technologies, such as communications, orthophoto mapping, and infrared photography.

The basic design of ICS and NIMS is well suited for hazardous materials incidents. Due to the complex involvement of the various local, regional, state, and federal agencies, ICS has become an indispensable tool in coordinating the response to these emergencies. In the past, the lack of clear-cut lines of authority and individual responsibilities have made it very difficult for public-safety agencies—such as fire, police, public works—to operate effectively together. The operating procedures, command structure and terminology used by each of the individual agencies can seem totally alien to the other involved organizations. Now, with this practical management tool at their disposal, all the individual agencies can collectively plan and pre-determine areas of functional responsibility and establish a common overall mode of operation. When the various emergency response organizations begin to plan and train together, it is obvious that common problems can be identified, shared and solved in a very cost efficient and effective manner.

To effectively utilize the resources and accommodate the needs of various agencies and jurisdictions involved with an incident, a comprehensive management system must be established. Furthermore, in order to develop and maintain efficiency, the management system should incorporate the following basic concepts:

- **ORGANIZATION**
- **CHAIN-OF-COMMAND**
- **UNITY-OF-COMMAND**
- **SPAN-OF-CONTROL**
- **DIVISION OF LABOR**
- **SUPERVISION AND LEADERSHIP**

**Organization** of available resources into a manageable, flexible entity enables the efficient development and implementation of the action plans necessary to resolve an incident. The **Chain-of-Command** is the hierarchical structure which identifies and establishes the relationships, roles and authority within an organization. It also provides for the transfer of authority and two-way communication between the various organizational levels. Maintaining the integrity of the Chain-of-Command assures that all

the vital links in the system are working together towards a common set of goals and objectives. The concept of **Unity-of-Command** assures that there is only one overall leader or commander, and that all personnel only have to report to, and receive directions from, one immediate supervisor. By limiting **Span-of-Control** to five subordinates, no single individual will be overwhelmed by attempting to organize, direct, or control too many subordinates or other resources. Establishing the **Division of Labor** assures that the correct persons are responsible for performing the appropriate tasks in the appropriate area of responsibility. Supervision and leadership provide effective direction, delegation of authority, monitoring of progress, good communications, and safety of operating personnel.



## ICS Operating Requirements

*As ICS I-200 is a prerequisite to this course, the following is intended to offer a short review of the operating requirements of the Incident Command System only. Please refer to your ICSI 200 course material for more specific information.*

There are 8 basic system design components used in the Incident Command System:

1. The system must provide for the following kinds of operation:
  - ✓ single jurisdiction or single agency.
  - ✓ single jurisdiction with multi-agency involvement.
  - ✓ multi-jurisdiction and/or multi-agency involvement.
2. The system's organizational structure must be able to adapt to any emergency or incident to which emergency service agencies would be expected to respond (fires, floods, earthquakes, hurricanes, tornados, tidal waves, riots, spills of hazardous materials and other natural or human-caused incidents).
3. The system must be applicable and acceptable to users throughout the country.
4. The system should be readily adaptable to new technology.

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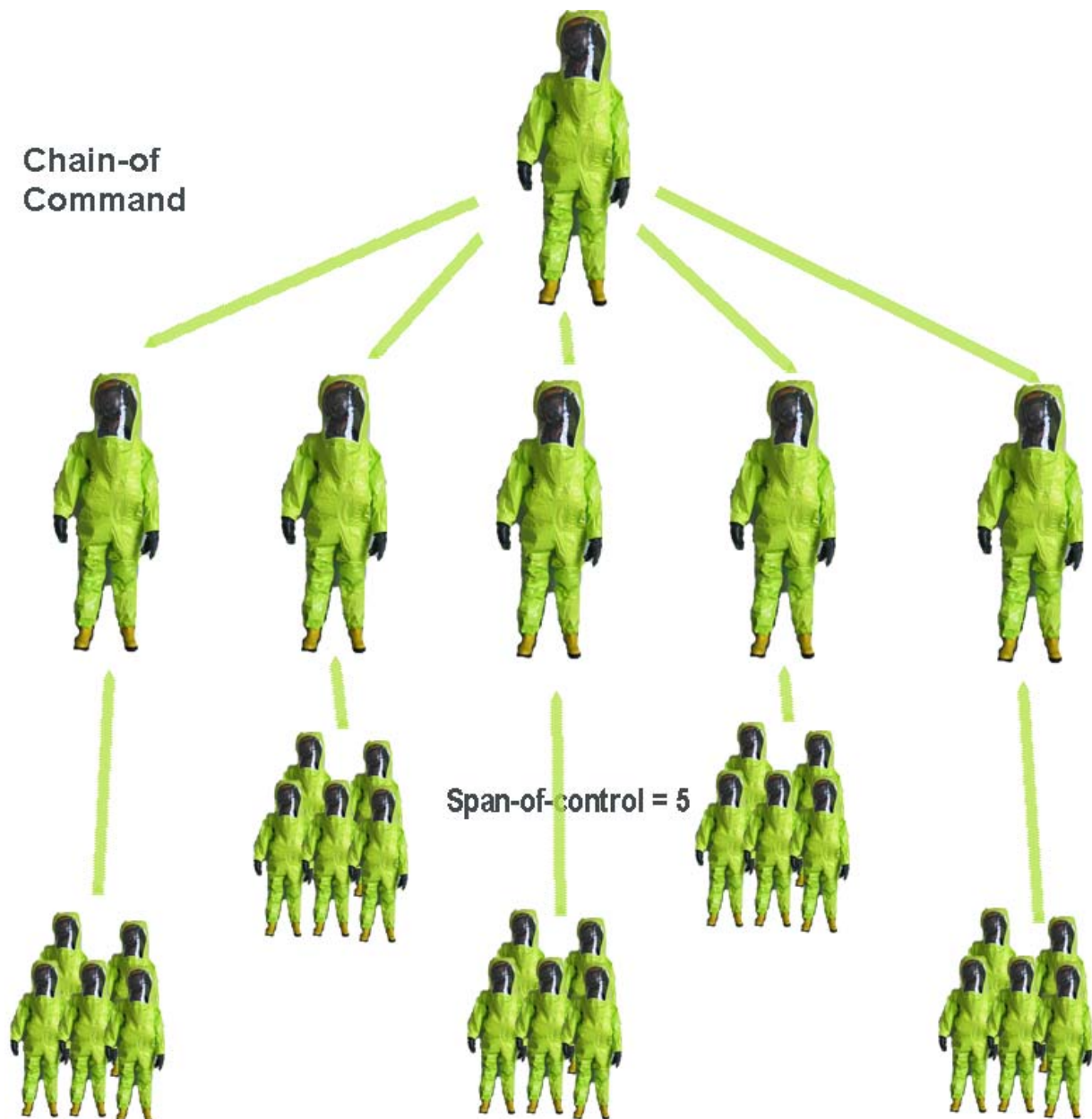
## HAZARDOUS MATERIALS ON-SCENE INCIDENT COMMANDER

5. The system must be able to expand in a logical manner from an initial attack situation into a major incident.
6. The system must have basic common elements in organization, terminology and procedures which allow for the maximum application and use of already developed qualifications and standards, and ensure continuation of a total mobility concept.
7. Implementation of the system should have the least possible disruption to existing systems.
8. The system must be effective in fulfilling all of the above requirements and yet be simple enough to ensure low operational maintenance costs.

The Incident Command System also has a number of components. These components, working together interactively, provide the basis for an effective ICS concept of operation:

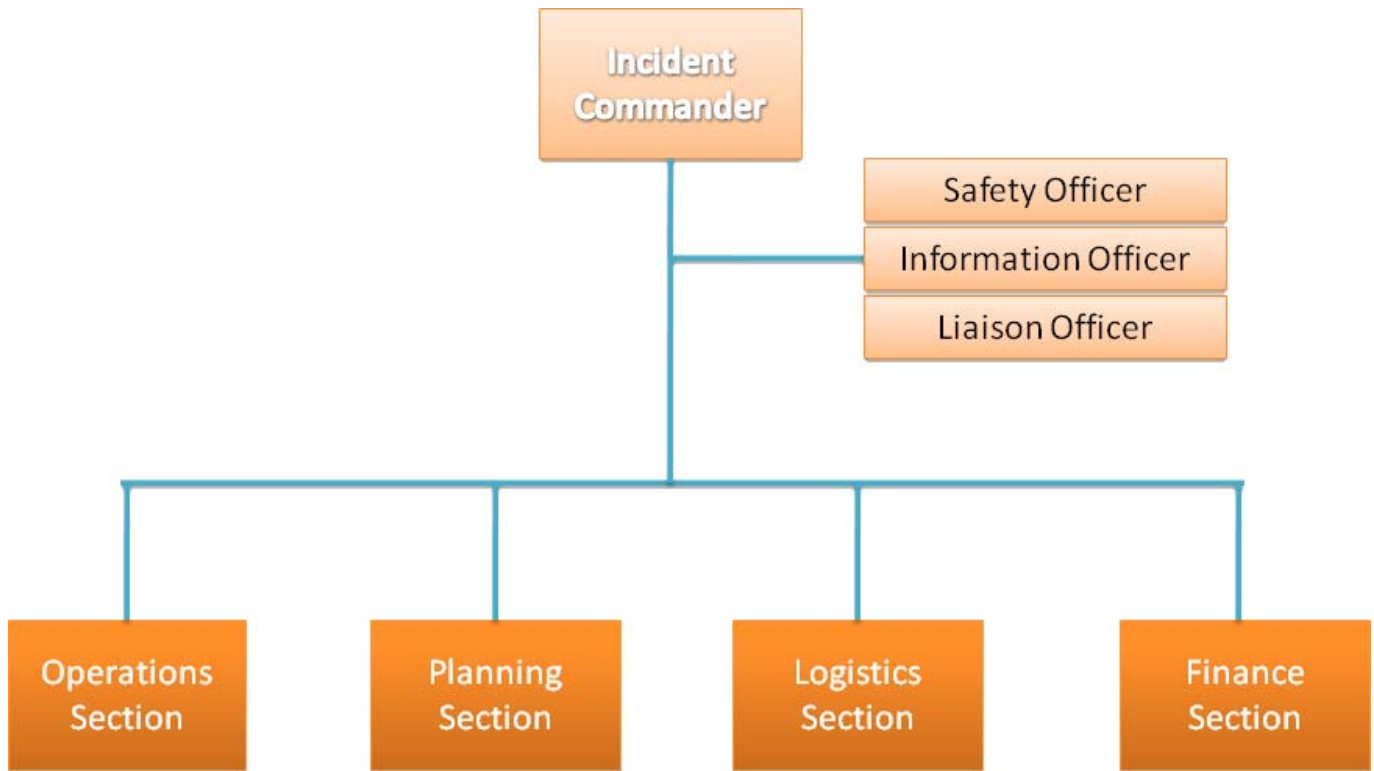
- ✓ **COMMON TERMINOLOGY**
- ✓ **MODULAR ORGANIZATION**
- ✓ **INTEGRATED COMMUNICATIONS**
- ✓ **UNIFIED COMMAND STRUCTURE**
- ✓ **CONSOLIDATED ACTION PLANS**
- ✓ **MANAGEABLE SPAN-OF-CONTROL**
- ✓ **PREDESIGNATED INCIDENT FACILITIES**
- ✓ **COMPREHENSIVE RESOURCE MANAGEMENT**

## Unity of Command



## Organization & Operation

The Incident Command System is organized into **five major sectional areas** which are structured as follows:



### Command Section

Command is responsible for the overall management of all incident activities including the development and implementation of strategic decisions. This function can be conducted through either a single or unified command structure depending on the nature and location of an incident. In the *single command* mode, the incident commander is solely responsible for the development of the strategic goals and objectives necessary to resolve an incident. In a *unified command structure*, the individuals designated by their various jurisdictions, or agencies, are jointly responsible for determining the goals, objectives, strategies and priorities. Obviously, because of the complex nature of hazardous materials incidents, many individual agencies and jurisdictions may have to be included in the scene management decision-making process, therefore, establishing the need for a unified command structure. To avoid creating confusion in the functional units, *unity-of-command* must be maintained. Therefore, after unified command has reached mutual agree-

ment, the final plan of action should only be implemented by one individual, the *Incident Commander*.

## INCIDENT COMMANDER

The Incident Commander is responsible for incident activities including the development and implementation of strategic decisions and for approving the ordering and releasing of resources.

### Duties:

- ✓ Review Common Responsibilities.
- ✓ Assesses incident situation and/or obtain from the prior Incident Commander.
- ✓ Determine Incident Objectives and Strategy.
- ✓ Establish the immediate priorities.
- ✓ Establish an Incident Command Post.
- ✓ Establish an appropriate organization.
- ✓ Ensure planning meetings are scheduled as required.
- ✓ Approve and authorize the implementation of an Incident Action Plan.
- ✓ Ensure that adequate safety measures are in place.
- ✓ Coordinate activity for all Command and General Staff.
- ✓ Coordinate with key people and officials.
- ✓ Approve requests for additional resources or for the release of resources.
- ✓ Keep agency administrator informed of incident status.
- ✓ Approve the use of trainees, volunteers and auxiliary personnel.
- ✓ Authorize release of information to the media.
- ✓ Ensure Incident Status Summary (ICS Form 209) is completed and forwarded to appropriate higher authority.
- ✓ Order the demobilization of the incident when appropriate.

Command also includes the provision for three specific staff positions, known as the *Command Staff*, to assume the responsibility for certain key activities in support of the command function. These staff positions are specifically identified with the following designations:

- **INFORMATION OFFICER**
- **SAFETY OFFICER**
- **LIAISON OFFICER**

### **INFORMATION OFFICER**

The Information Officer, a member of the Command Staff, is responsible for the formulation and release of information about the incident to the news media and other appropriate agencies and organizations.

#### **Duties:**

- ✓ Review Common Responsibilities.
- ✓ Check with the IC for any limits on release of information.
- ✓ Develop material for use in media briefings.
- ✓ Obtain approval from the IC of media releases.
- ✓ Inform media and conduct media briefings.
- ✓ Arrange for tours, interviews or briefings that may be required.
- ✓ Obtain media information that may be useful to incident planning.
- ✓ Maintain current information summaries and/or displays on the incident and provide information on status of incident to assigned personnel.
- ✓ Attends meetings to update information releases.
- ✓ Maintains Unit/Activity Log (ICS 214).

### **SAFETY OFFICER**

The Safety Officer, a member of the Command Staff, is responsible for monitoring and assessing hazardous and unsafe situations and developing measures for assuring personnel safety. The Safety Officer will correct unsafe acts or conditions through the regular line of authority, although the Officer may exercise emergency authority, to stop or prevent unsafe acts when immediate action is required. The Officer maintains awareness of active and developing situations, approves the Medical Plan (ICS Form 206), and includes safety messages in each Incident Action Plan.

#### **Duties:**

- ✓ Review Common Responsibilities.
- ✓ Participate in planning meetings.
- ✓ Identify hazardous situations associated with the incident.
- ✓ Reviews Incident Action Plans for safety implications.
- ✓ Exercise emergency authority to stop and prevent unsafe acts.
- ✓ Investigates accidents that have occurred within incident areas.
- ✓ Assign assistants as needed.
- ✓ Develop hazardous materials site safety plan as required.
- ✓ Maintains Unit/Activity Log (ICS 214).



**LIAISON OFFICER**

The Liaison Officer is a member of the Command Staff, and is the point of contact for the assisting and cooperating Agency Representatives. This includes Agency Representatives from other fire agencies, Red Cross, law enforcement, public works and engineering organizations, etc. The Liaison Officer will be from the jurisdictional agency.

**Duties:**

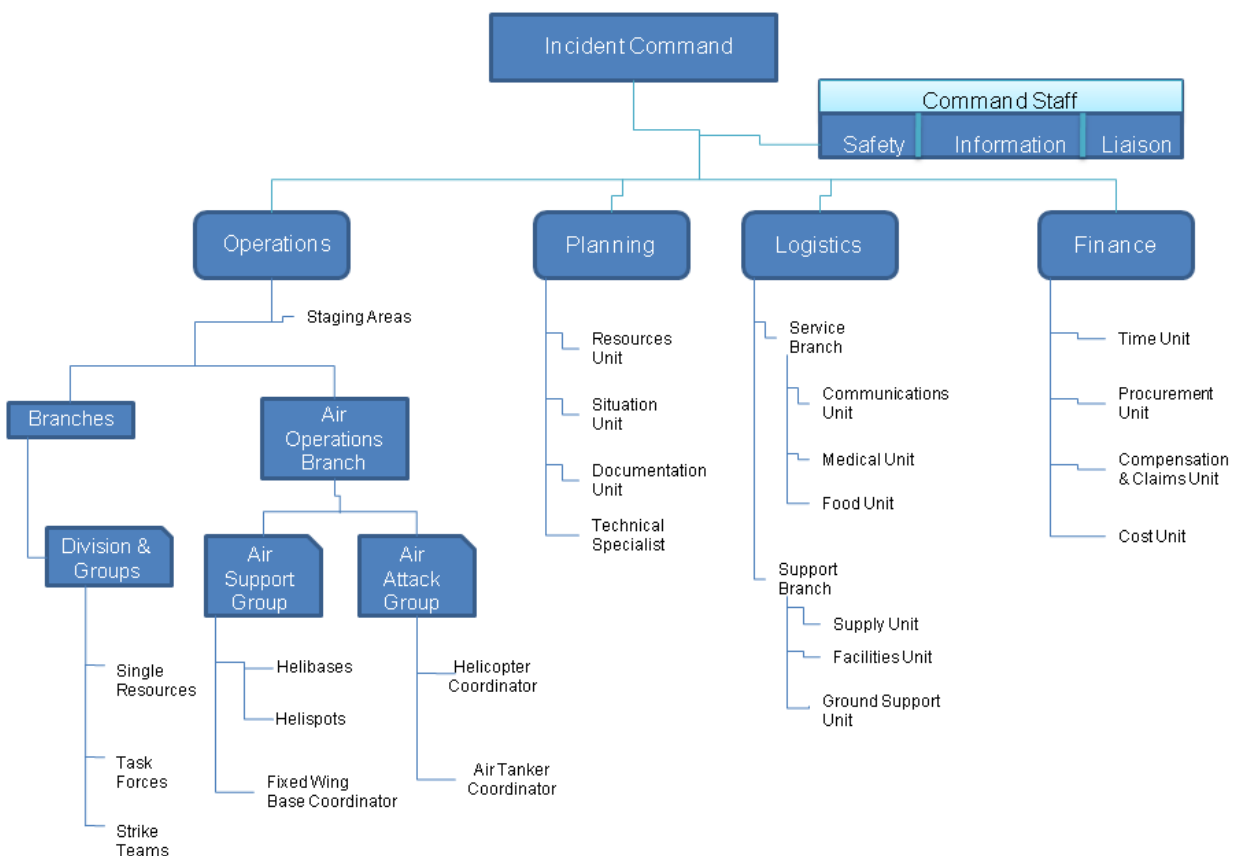
- √ Review Common Responsibilities.
- √ Be a contact for Agency Representatives.
- √ Maintain a list of assisting and cooperating agencies and their representatives.
- √ Assist in establishing and coordination of inter-agency contacts.
- √ Monitor incident operations to identify current or potential inter-organizational problems.
- √ Participate in planning meetings, providing current resource status, including limitations and capability of assisting agency resources.
- √ Maintains Unit/Activity Log (ICS Form 214).

## HAZARDOUS MATERIALS ON-SCENE INCIDENT COMMANDER

### Typical Incident Command System for a major wildland fire

ICS can be applicable for major wildland and structural fires, hazardous materials incidents, aircraft accidents, mass casualty incidents, floods, earthquakes, hurricanes, tornadoes, tsunamis and other natural disasters. Due to its functional unit management structure, ICS is equally applicable for regular day-to-day operations, as well as for major incidents. The following organizational flow-chart illustrates a typical Incident Command Structure for a major Wildland Fire.

Branches can also be established when the nature of an incident calls for a *functional Branch structure*. An example of this would be an aircraft crash involving mass casualty, fire and hazardous materials. The following organizational flow-chart illustrates the typical interaction between the Branches in an *Operations Section* that could be utilized for such an emergency.



## Operation Section

### OPERATIONS SECTION CHIEF

The Operations Section Chief, a member of the General Staff, is responsible for the management of all operations directly applicable to the primary mission. The Operations Chief activates and supervises organization elements in accordance with the Incident Action Plan and directs its execution. The Operations Chief also directs the preparation of unit operational plans, requests or releases resources, makes expedient changes to the Incident Action Plan as necessary, and reports such to the Incident Commander.

#### Duties:

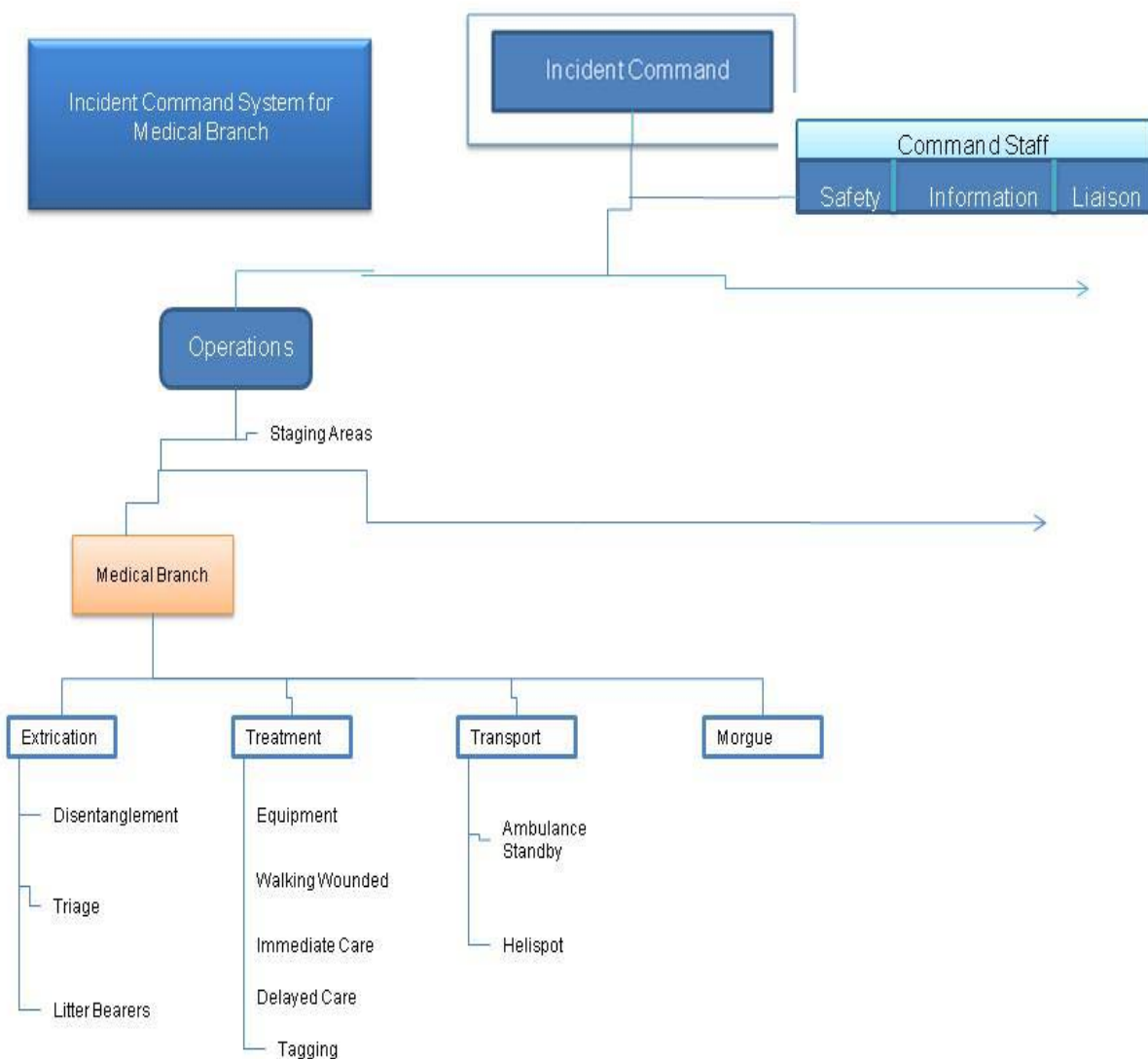
- ✓ Review Common Responsibilities.
- ✓ Develops operations portion of Incident Action Plan.
- ✓ Briefs and assigns operations personnel in accordance with Incident Action Plan.
- ✓ Supervises operations.
- ✓ Determines need and requests additional resources.
- ✓ Reviews suggested list of resources to be released and initiates recommendation for release of resources.
- ✓ Assembles and disassembles strike teams assigned to Operations Section.
- ✓ Reports information about special activities, events, and occurrences to Incident Commander.
- ✓ Maintain Unit/Activity Log (ICS Form 214)

### BRANCHES, DIVISIONS, GROUPS, AND TEAMS

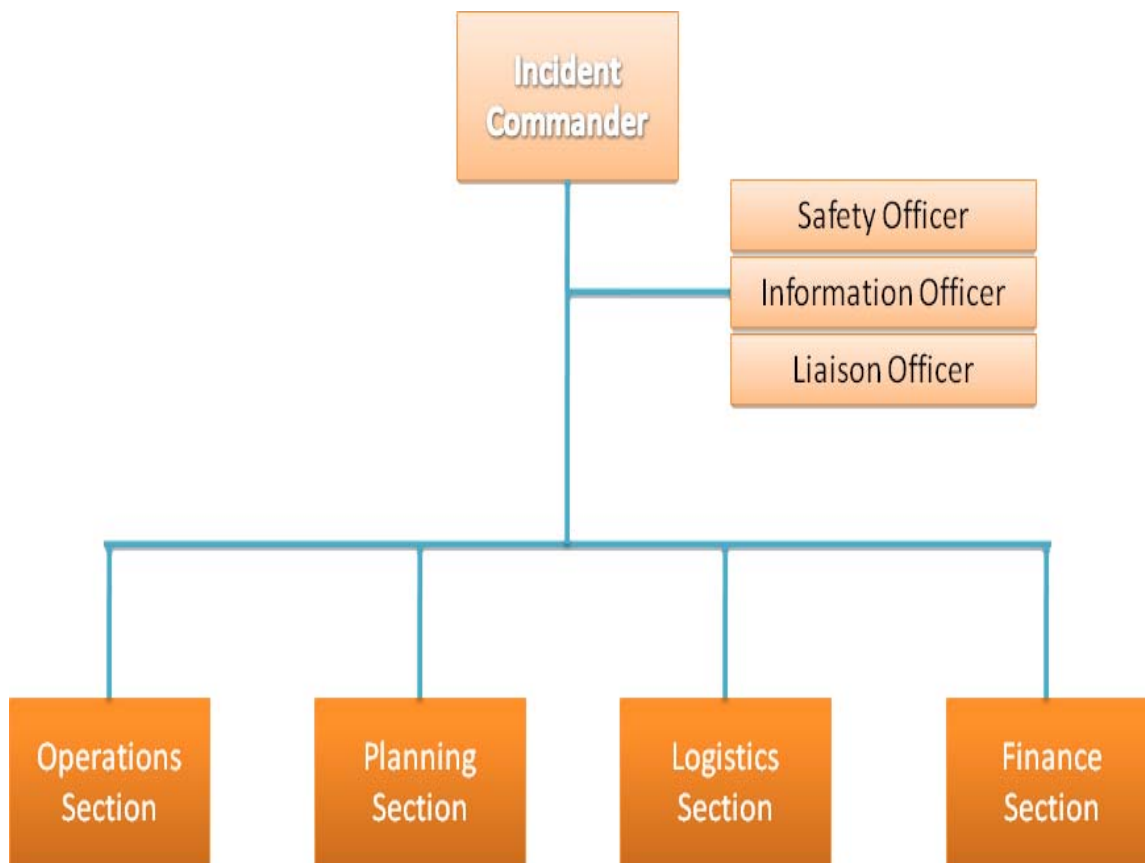
When the number of resources exceeds the span-of-control of the Operations Section Chief on an incident, Divisions and Groups should be established. *Divisions* are normally established to divide the incident into *geographic areas of operation*. Whereas, *Groups* should be established to divide the incident into *functional areas of responsibility*, i.e. site control group, evacuation group, ventilation group and salvage group. If the number of Divisions or Groups exceed the recommended 5:1 span-of-control, the Operations Chief can establish *Branches* and re-allocate the divisions and groups within the Branches as necessary.

## HAZARDOUS MATERIALS ON-SCENE INCIDENT COMMANDER

Branches can also be established when the nature of an incident calls for a *functional Branch structure*. An example of this would be an aircraft crash involving mass casualty, fire and hazardous materials. The following organizational flow chart illustrates the typical interaction between the Branches in an *Operations Section* that could be utilized for such an emergency.



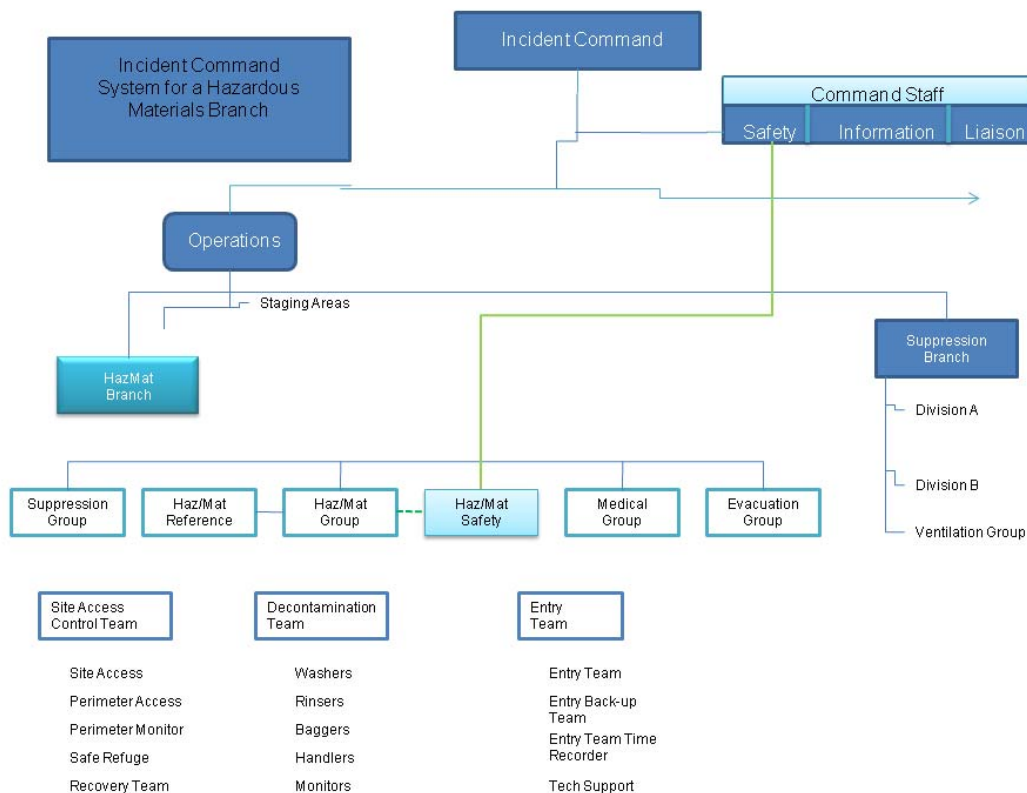
As is shown in the previous flow-chart, each Branch can be divided into Divisions or Groups, depending on whether the need is for a geographical or a functional assignment. These Divisions and Groups could be divided into Groups or Units, each having a different functional area of responsibility. For instance, the *Medical Branch* could be divided into the following Groups: *Extrication, Treatment, Transport and Morgue*. Each of these groups could again be divided into functional teams as demonstrated in the following flow-chart for a typical Medical Branch at a *Mass Casualty Incident*.



## HAZARDOUS MATERIALS ON-SCENE INCIDENT COMMANDER

In a similar manner, the *Hazardous Materials Branch*, or Group (depending on the size of the incident), could be divided into the Entry Unit, the Decontamination Unit, and the Site Access Control Unit.

The illustration on this page depicts how a Haz/Mat Branch and a Suppression Branch could be established under the Operations Section.



## Haz/Mat Group Duties & Responsibilities

The following information has been taken in part from **FIREScope Hazardous Materials Specialist Group**, December, 1991, "Haz/Mat Position Descriptions & Functions." Check with FIREScope for updates.

### HAZARDOUS MATERIALS GROUP SUPERVISOR

The Hazardous Materials Group Supervisor reports to the Operations Chief (or, if branches are activated, the Hazardous Materials Branch Director). The Hazardous Materials Group Supervisor is responsible for the implementation of the phases of the Incident Action Plan dealing with Hazardous Materials Group operations, assignment of resources within the Group, and reporting on progress of control operations and status of resources within the Group. The Hazardous Materials Group Supervisor directs the overall operations of the Hazardous Materials Group.

#### Duties:

- ✓ Review Common Responsibilities.
- ✓ Ensures development of Control Zones and Access Control Points, and the placement of appropriate control lines.
- ✓ Evaluates and recommends public protection action options to the Hazardous Materials Branch Director or Operations Chief.
- ✓ Ensures that the current weather data and future weather predictions are obtained.
- ✓ Establishes environmental monitoring of the hazard site contaminants.
- ✓ Ensures that a Site Safety Plan is developed and implemented.
- ✓ Conducts safety meeting with the Hazardous Materials Group.
- ✓ Participates, when requested, in development of the Incident Action Plan. (Develops the Hazardous Materials attachment to the Incident Action Plan).
- ✓ Ensures that nationally recommended safe operational procedures are followed.
- ✓ Ensures that the proper Personal Protective Equipment is selected and used.
- ✓ Ensures that the appropriate allied agencies are notified through the Incident Commander.
- ✓ Maintains Unit/Activity Log (ICS 214).

### **HAZARDOUS MATERIALS SAFETY BRIEFING**

The Hazardous Materials Action Briefing is conducted by the Hazardous Materials Group Supervisor and contains, but is not limited to, the following:

1. Extent of Entry: the number of personnel and duration of entry.
2. General Control Objectives: the job to be performed, i.e., rescue, investigation, containment, or neutralization.
3. Specific rescue plan (first-aid and decontamination of patients).
4. Procedures and methods of Decontamination.

### **SITE ACCESS CONTROL LEADER**

The Site Access Control Leader reports to the Hazardous Materials Group Supervisor. The Site Access Control Leader is responsible for the control of the movement of all people and equipment through appropriate access routes at the hazard site. This position ensures that the spread of contaminants is controlled and that records are maintained.

#### **Duties:**

- ✓ Review Common Responsibilities.
- ✓ Organizes and supervises assigned personnel to control access to the hazard site.
- ✓ Oversees the placement of the Exclusionary Control Line and the Contamination Control Line.
- ✓ Ensures appropriate action is taken to prevent the spread of contamination.
- ✓ Establishes the Safe Refuge area within the Contamination Reduction Zone. Appoints Safe Refuge Area Manager (as needed).
- ✓ Ensures that injured or exposed individuals are decontaminated prior to departure from the hazard site.
- ✓ Tracks persons passing through the Contamination Control Line to ensure that long term observations are provided.
- ✓ Coordinates with the Medical Group for proper separation and tracking of potentially contaminated individuals needing medical attention.
- ✓ Maintains observations of any changes in climatic conditions or other circumstances external to the hazard site.
- ✓ Maintains communications and coordinates operations with the Entry Leader.
- ✓ Maintains communications and coordinates operations with the Decontamination Unit Leader.
- ✓ Maintains Unit/Activity Log (ICS 214).



## SAFE REFUGE AREA

The Safe Refuge Area is an area for the assemblage of civilian personnel who were witnesses to the hazardous materials incident or who were on-site at the time of the spill. This assemblage of individuals will assist the Incident Commander in collecting intelligence information, help to reduce confusion at the incident, and provide for the separation of contaminated persons from the uncontaminated. The area should be located inside the Contamination Control Line and away from the Personnel Decontamination Station. When activated, the Medical Group could locate their Triage Area and Transportation Area near the Safe Refuge Area, *but they should not be co-located*.

## SAFE REFUGE AREA MANAGER

The Safe Refuge Area Manager reports to the Site Access Control Leader and coordinates with the Decontamination Leader and the Entry Leader. The Safe Refuge Area Manager is responsible for evaluating and prioritizing victims for treatment, collecting information from the victims, and preventing the spread of contamination by these victims. If there is a need for the Safe Refuge Area Manager to enter the Contamination Reduction Zone in order to fulfill assigned responsibilities, then the appropriate Personnel Protective Equipment shall be worn.

### Duties:

- ✓ Review Common Responsibilities.
- ✓ Establishes the Safe Refuge Area within the Contamination Reduction Zone adjacent to the Contamination Reduction Corridor and the exclusion Control Line.
- ✓ Monitor the hazardous materials release to ensure that the Safe Refuge Area is not subject to exposure.
- ✓ Assist the Site Access Control Leader by ensuring the victims are evaluated for contamination.
- ✓ Manage the Safe Refuge Area for the holding and evaluation of victims who may have information about the incident, or if suspected of having contamination.
- ✓ Maintain communications with the Entry Leader to coordinate the movement of victims from the Refuge Area(s) in the exclusion Zone to the Safe Refuge Area.
- ✓ Maintain communications with the Decontamination Leader to coordinate the movement of victims from the Safe Refuge Area into the Contamination Reduction Corridor, if needed.
- ✓ Maintains Unit/Activity Log (ICS 214).

### **ENTRY LEADER**

The Entry Leader reports to the Hazardous Materials Group Supervisor. The Entry Leader is responsible for all activities taking place in the Exclusion Area (Hot Zone).

#### **Duties:**

- √ Review Common Responsibilities.
- √ Supervises entry operations.
- √ Recommends actions to mitigate the situation within the Exclusion Zone.
- √ Initiates actions, as directed by the Hazardous Materials Group Supervisor, to mitigate the hazardous materials release or threatened release.
- √ Maintains communication and coordinates operations with the Decontamination Leader.
- √ Maintains communication and coordinates operations with the Site Access Control Leader and the Safe Refuge Area Manager (if activated).
- √ Maintains communication and coordinates operations with Technical Specialist - Hazardous Materials Reference.
- √ Maintains control of the movement of people and equipment within the Exclusion Zone, including contaminated victims.
- √ Directs rescue operations, as needed, within the Exclusion Zone.
- √ Maintains Unit/Activity Log (ICS 214).

### **PRIMARY ENTRY TEAM**

The Primary Entry Team shall consist of a minimum of two people in proper protective equipment. The team must maintain communications with Entry Leader. The Leader must report on conditions inside the Exclusion Area, identify the product or gather samples, if necessary, assess the degree of hazard (i.e., size and/or quantity of spill), and mitigate or contain the hazard as directed.

### **BACK-UP TEAM**

The Back-Up Team must consist of an equal number of personnel in the same protective equipment as the Entry Team. They must be prepared to rescue the Entry Team, assist and/or relieve the Entry Team in the containment of the hazard, and furnish additional equipment or supplies to Entry Team as needed.

**TECHNICAL SUPPORT TEAM**

The Technical Support Team provides additional personnel who are not assigned to the Primary Entry Team or the Back-Up Team. They assist the Primary Entry and Back-Up Teams in donning proper protective equipment, assist the Entry Leader with maintenance of time records, and maintain communications with Entry Leader, Primary Entry Team and Back-Up Team.

**DECONTAMINATION LEADER**

The Decontamination Leader reports to the Hazardous Materials Group Supervisor. The Decontamination Leader is responsible for the operations of the decontamination element, providing decontamination as required by the Incident Action Plan.

**Duties:**

- √ Review Common Responsibilities.
- √ Establishes the Contamination Reduction Corridor.
- √ Identifies contaminated people and equipment.
- √ Supervises the operations of the Decontamination element in the process of decontaminating people and equipment.
- √ Maintains control of movement of people and equipment within the Contamination Reduction Zone.
- √ Maintains communications and coordinates operations with the Entry Leader.
- √ Maintains communications and coordinates operations with the Site Access Control Leader and the Safe Refuge Area Manager (if activated).
- √ Coordinates the transfer of contaminated patients requiring medical attention (after decontamination) to the Medical Group.
- √ Coordinates handling, storage, and transfer of contaminants within the Contamination Reduction Zone.
- √ Maintains Unit/Activity Log (ICS 214).

**TECHNICAL SPECIALIST - HAZARDOUS MATERIALS  
REFERENCE**

Technical Specialist - Hazardous Materials Reference reports to the Hazardous Materials Group Supervisor or Hazardous Materials Branch Director if activated). This position is responsible for providing technical information and assistance to the Hazardous Materials Group and the Planning Section using various sources such as computer databases, technical journals, public and private technical information agencies, CHEMTREC, and phone contact with facility representatives, and product specialists. The Technical Specialist - Hazardous Materials Reference may provide product identification, verification, physical properties, and hazardous characteristics using various reference sources, hazardous categorization tests, and/or any other means of identifying unknown materials.

**Duties:**

- √ Review Common Responsibilities.
- √ Obtains briefing from the Planning Section Chief.
- √ Provides technical support to the Hazardous Materials Group Supervisor.
- √ Maintains communications and coordinates operations with the Entry Leader.
- √ Provide and interprets environmental monitoring information.
- √ Provide analysis of hazardous material sample.
- √ Determines personal protective equipment compatibility to hazardous material.
- √ Provide technical information of the incident for documentation.
- √ Provide technical information management with public and private agencies, i.e., Poison Control Center, Tox Center, CHEMTREC, State Department of Food and Agriculture, National Response Team.
- √ Assists Planning Section with projecting the potential environmental effects of the release.
- √ Maintains Unit/Activity Log. (ICS 214).

**ASSISTANT SAFETY OFFICER - HAZARDOUS MATERIALS**

The Assistant Safety Officer - Hazardous Materials (ASO<sub>HM</sub>) reports to the Incident Safety Officer, and coordinates group activities with the Hazardous Materials Group Supervisor. The ASO<sub>HM</sub> coordinates safety related activities directly relating to the Hazardous Materials Group operations as mandated by 29 CFR Part 1910.120. The position also advises the Hazardous Materials Group Supervisor on all aspects of health and safety and has the authority to stop or prevent unsafe acts. It is mandatory that a Assistant Safety Officer -

be appointed at all hazardous materials incidents. In a multi-activity incident the ASO/M does NOT act as Safety Officer for the overall incident.

### **Duties**

- ✓ Review Common Responsibilities.
- ✓ Obtains briefing from the Hazardous Materials Group Supervisor.
- ✓ Participates in the preparation and implementation of the Site Safety Plan.
- ✓ Advises the Hazardous Materials Group Supervisor of deviations from the Site Safety Plan or any dangerous situations.
- ✓ Has the full authority to alter, suspend or terminate any activity that may be judged to be unsafe.
- ✓ Ensures protection of the Hazardous Materials Group personnel from physical, environmental and chemical hazards/exposures.
- ✓ Ensures provision of required emergency medical services for assigned personnel and coordinate with the Medical Unit Leader.
- ✓ Ensures that medical related records for Hazardous Materials Group personnel are maintained.
- ✓ Maintains Unit/Activity Log (ICS 214).

#### **PRIOR TO ENTERING THE EXCLUSION AREA (HOT ZONE) THE FOLLOWING SHALL BE COMPLETED**

1. Hazardous Materials and Safety briefing will be given.
2. Decontamination procedures will be established.
3. Personnel Decontamination Station will be set up.
4. Entry and Back-Up Teams will be in proper protective equipment.
5. The Back-Up Team will be ready and in position.
6. Tools and equipment will be checked.
7. Communications equipment will be checked, prior to entry.

**WHENEVER POSSIBLE, OPERATE IN THE  
FOLLOWING MANNER:**

1. Operate upwind and uphill of the Incident.
2. Make entry and egress through Access Control Points.
3. Follow predesignated routes.
4. Make final equipment checks at the Access Control Point to the Exclusion Area (Hot Zone).

## **Incident Command Worksheet**

An example of an Incident Command Worksheet is given on the following page. This Worksheet was developed by Steve Franklin, Captain, City of Campbell Fire Department, Campbell, California. The purpose of an Incident Command Worksheet is to have a summary of all the pertinent data available to the Commander in one highly-visible place for easy access and reference.

The Incident Commander will need to assess the following:

- ***NAME, LOCATION & NUMBER OF THE INCIDENT***
- ***THE COMMAND POST LOCATION***
- ***NATURE OF THE EMERGENCY***
- ***WEATHER INFORMATION***
- ***SUBSTANCE DATA***
- ***HAZARD DATA***
- ***RESOURCES, ASSIGNED OR STAGED***
- ***COMMAND STRUCTURE***
- ***SAFETY CHECK LIST***

## CHAPTER & LECTURE NOTES:

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## **Group Exercise Session #2**

The following group exercises are intended to reinforce the main points presented in the text, and to provide the student with the opportunity to demonstrate competency in establishing an incident command structure.

The first exercise has been completed in full to demonstrate what is to be expected from the student. The second exercise is to be completed in a study group format.

At the conclusion of this session a five minute presentation containing an overview of each group's findings will be delivered by a representative from each of the groups.



# INCIDENT COMMAND STRUCTURE ORGANIZATION SHEET

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## SCENARIO #1

Using the Scenario #1 information located at the end of the Hazard Assessment chapter, determine the following:

1. The ICS organization to be utilized for the incident.
2. The roles and functions of the various groups and teams.

**Sketch ICS Organization Chart here**

## INCIDENT COMMAND STRUCTURE ORGANIZATION SHEET

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### Group & Team Functions

#### I. HAZ/MAT GROUP

- a. **Site Control Team:** Isolate area and deny entry, maintain incident security.
- b. **Entry Team:** Build dikes to contain any contaminated water runoff.
- c. **Decontamination Team:** Decontaminate entry.

#### II. SUPPRESSION GROUP

- a. Protect exposed buildings.
- b. Provide fire watch.

#### III. EVACUATION GROUP

- a. Evacuate downwind areas (south at Gaviota St./West at 1st Ave./North at Balboa St./East at 10th Ave.

# INCIDENT COMMAND STRUCTURE ORGANIZATION SHEET

---

## SCENARIO #2

Using the Scenario #2 information located at the end of the Hazard Assessment chapter, determine the following:

1. The ICS organization to be utilized for the incident.
2. The roles and functions of the various groups and teams.

 Sketch ICS Organization Chart here

INCIDENT COMMAND

I. Haz/Mat Group • II. Suppression Group • III. Evacuation Group

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## CHAPTER & LECTURE NOTES:

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40 CFR Table 302.4 & 49 CFR Section 171  
Gov. Code 8574.7, AB 2185/2187  
SARA Title III Section 304  
CA Health & Safety Code Ch. 6.95  
OSHA's Final Rule - 29 CFR 1910.120  
NFPA Standard 472, CERCLA

## Notification Requirements & Inter-agency Involvement

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On completion of this chapter the student will be able to:

1. *Describe the procedure* for notification of the appropriate agencies having functional or jurisdictional responsibility at an emergency involving hazardous materials.
2. *Demonstrate competency* in implementing local, state and federal emergency response plans.
3. *Describe the roles* of the various local, state and federal agencies at a hazardous materials emergency and describe the importance of coordination between the various agencies at the incident scene.
4. *Describe the roles* to be enacted by non-governmental agencies at a hazardous materials incident and outline the considerations for accommodating the media at an emergency incident.
5. *Describe how the Unified Command Structure is used* to formulate the strategic goals necessary for remedial actions at a hazardous materials emergency and describe how final authority is determined.

## Mandatory Notification Requirements

It is the responsibility of the Incident Commander to ensure that all mandatory notifications are made to local, state and federal agencies. Furthermore, in California it is required that moderate or greater incidents be reported to the California Emergency Management Agency (CalEMA) formerly OES 24-hour *Warning Center* (1-800-852-7550). This task may seem intimidating at first, considering all the numerous agencies that can be involved, however, in actuality it is very straight-forward and quickly accomplished. Proper notification is vital for the proper tracking and coordination of incidents for statistical purposes and for obtaining funds for clean-up.

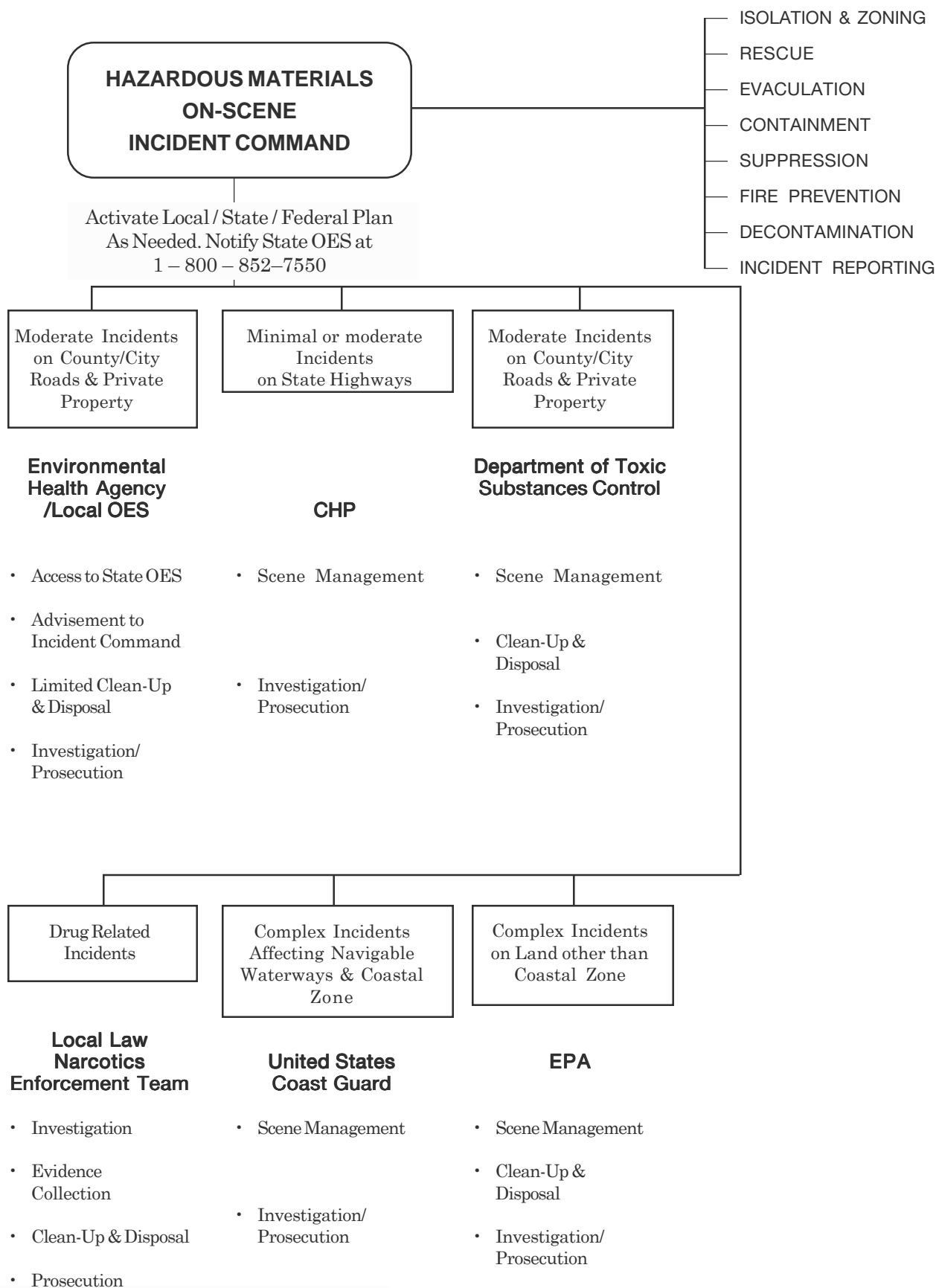
All incidents involving *reportable quantities (RQs)*, and therefore requiring complex remedial actions (Level II and III incidents), have mandatory notification requirements. Once a call is received through communications dispatch, the communications operator may immediately notify the state Office of Emergency Services (OES) and the federal National Response Center if the incident is known to involve reportable quantities. If an Incident Commander arrives on-scene and determines that a reportable quantity is involved, the communications center must be instructed to notify the local/state OES, and National Response Center. As the incident may have already been reported to the state Office of Emergency Services by another agency, or by dispatch, the OES may already be on stand-by, waiting for the Incident Commander's initial assessment. These agencies will remain on stand-by until a report is received from the initial responding units as to the actual magnitude and complexity of the emergency and the degree of involvement that will be required from the various agencies. The following flow chart outlines the general *flow of responsibility* of the various local, state and federal agencies.

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All incidents involving reportable quantities (RQs), ...(Level II and III incidents), have **mandatory notification requirements**.

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The notification system is designed to allow and encourage many *cross-notifications* (see diagram on the following page). The state Office of Emergency Services will notify the National Response Center as appropriate, or vice versa. If the incident originates on a state highway, the Highway Patrol is required to notify the state Office of Emergency Services directly.

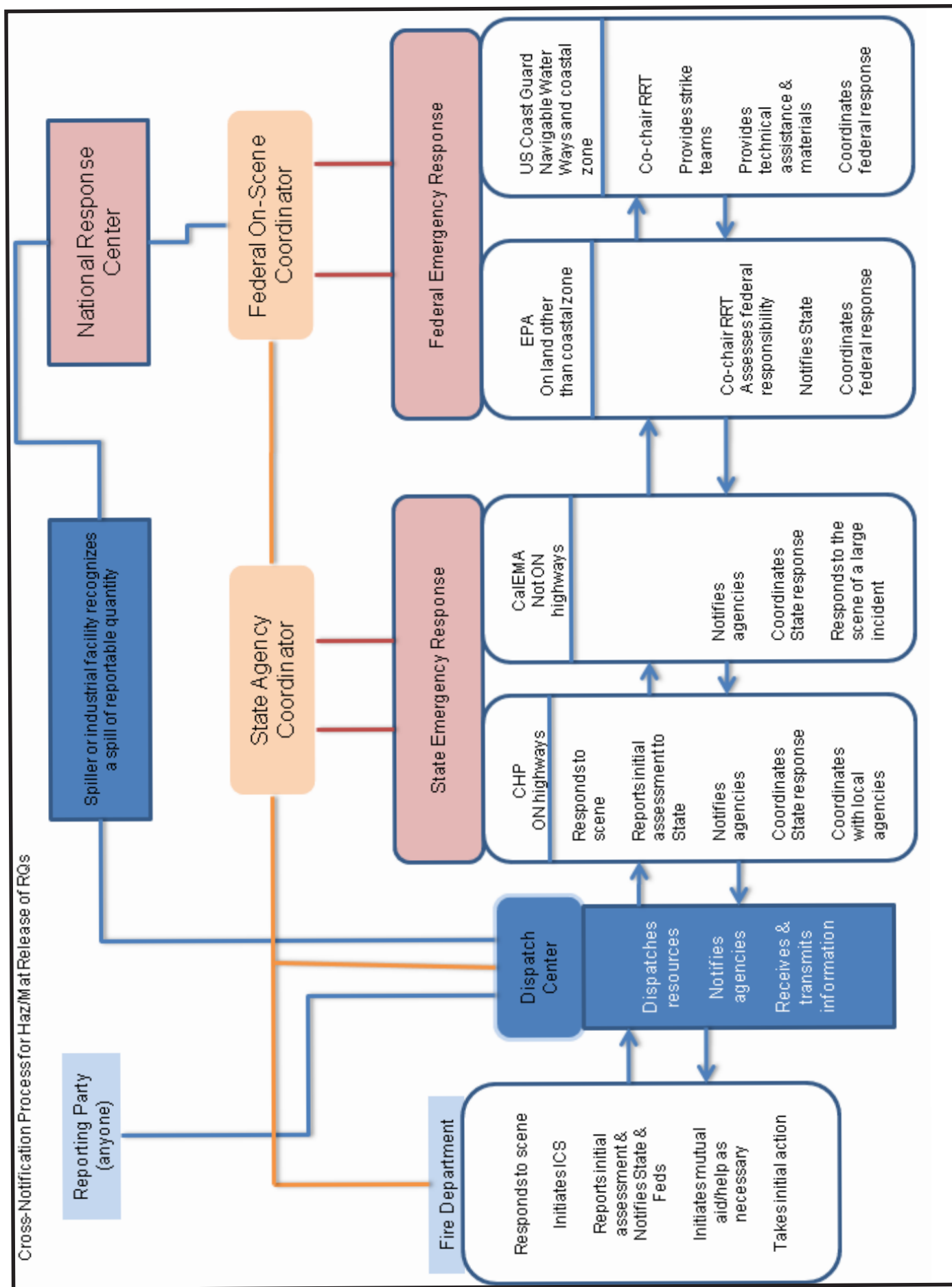
Notification is an easy task for the Incident Commander. A more difficult task is to know exactly what resources are available and how to access them. Fire departments should use pre-planning techniques and simulated exercises to ascertain how much help can be realistically expected in their community. Depending on the individual state involved, local agencies can vary greatly in size and scope of practice. Therefore, the potential Incident Commander must know the realities of exactly what resources can be actually relied upon within his or her individual community.

Listed below are local, state, and federal government and private agencies that can be used as resources to the Incident Commander on hazardous materials emergencies. The information presented here is based on the Hazardous Materials Incident Contingency Plan, California State Office of Emergency Services, 1982; and the Oil Spill Contingency Plan, Department of Fish and Game, State of California, 1983.

## **Local Agencies**

### **County Office of Emergency Services**

When a hazardous materials Level II or III incident occurs in its jurisdiction, the local county Office of Emergency Services is also responsible for notifying the appropriate agencies such as the state OES, the federal National Response Center, or United States Coast Guard and any other concerned agencies. The county Office of Emergency Services also *may* provide radiological monitoring, resources and equipment as requested by the Incident Commander and *may* establish a communications network. Every potential Incident Commander should be aware of the local Hazardous Materials Response Plan and know specifically what help is actually available from the local Office of Emergency Services.



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The County Health Officer has...“***sole responsibility*** in declaring an incident site free of contamination, and therefore safe for reentry by the public.”

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## Local Law Enforcement

Under Section 2454 & 24563 of the California Vehicle Code, the law enforcement agency having primary investigative authority is responsible for crowd and traffic control, isolating the scene of the incident, helping with evacuation, investigation, evidence collection, protecting the crime scene and all other concerns that are within the normal scope of law enforcement. If the incident occurs within city limits, the local city police department would be responsible for these functions, whereas, if the incident occurs in an unincorporated area, the local sheriff's office would be responsible. However, if the incident occurs on a state highway, the State Highway Patrol has jurisdiction, and therefore, scene management responsibilities. Law enforcement personnel must be limited to operating within established safety zones and within the limits of their personal protection.

## Public Works

The local City or County Public Works Department is responsible for providing personnel, equipment, and material resources, such as sand and dirt, to mitigate the incident. Public Works personnel should be trained to assist first responders, but they must be limited to operating within established safety zones. Public Works departments may coordinate operations with irrigation, domestic water and waste water treatment agencies and provide assistance for incidents where there is possible surface or groundwater contamination.

Local water supply agencies maintaining community water systems can provide remedial action when a hazardous materials incident may affect water sources. Water agencies notify and coordinate with regional water quality control boards and the State Department of Water Resources for incidents affecting water quality and supply.

## Health Departments

During a hazardous materials incident, the local city or county Environmental Health Department is responsible for safeguarding public health coordinating emergency medical services and providing technical advisement to the Incident Commander. The health department may assist with the identification of the hazardous materials involved in an incident, provide health and safety information and facilitates the delivery of hazardous materials to proper disposal sites. The Health Officer may also require responsible private parties to provide information as to the identity, properties and reactions of related materials during a health emergency. County Health Officers are also authorized to declare a hazardous materials

related “state of emergency” in their individual jurisdictions if there is an immediate threat to human health. Furthermore, they have *sole responsibility* in declaring an incident site free of contamination and therefore, safe for reentry by the public.

### **County Agricultural Commissioner**

The county agricultural commissioner is responsible for enforcement of all state and federal regulations pertaining to herbicides and pesticides. The Commissioner provides technical advice on hazardous materials incidents involving agricultural chemicals and may assist in incident clean-up. The Commissioner’s office *must* be notified if agricultural chemicals are involved in an incident.

### **Sanitation & Flood Control Districts**

Local sanitation and flood control districts are responsible for providing storm drain and sewer system maps to the Incident Commander and to open or close drain systems as needed.

### **Air Pollution Control Districts**

The air pollution control district can provide expert advice on current and predicted patterns of airborne pollutants and plume development to the incident commander during hazardous materials incidents. Emergency Response Teams and contingency planners who use the computer based CAMEO information system often keep a modem link to their local Air Pollution Control District to access this information quickly. The CAMEO system includes a large chemical database, local facility plans and a mapping system that can track airborne plumes when supplied with the current weather conditions. The air pollution control district may also provide laboratory support to identify an airborne substance and to monitor certain airborne pollutants.

### **Schools**

Reported or threatened release of acutely hazardous materials, fire or explosion involving material threatening to release within one-half mile of a school requires notification of the superintendent of the school district having jurisdiction. H&S 25507.10

## **State Government Responsibilities**



### **State Scene Management System**

The Scene Management System is initiated at the time of state notification. It supplements and expands the Incident Command System employed by the local fire department when its capabilities or resources are no longer sufficient to manage the incident. *It does not replace the Incident Command System.* This system allows an orderly expansion from a small incident to one that involves a number of agencies and it is intended to be staffed and operated by qualified personnel from the state operating team. The first state official on the scene assumes authority over state operations until relieved by the state's Agency Coordinator. The state official must work with the Incident Commander to determine the type and amount of hazardous material released, the responsible party, the potential impact on human populations and sensitive environmental areas; and the direction and speed the material is moving. This information provides the basis for all further notifications and agency involvements.



### **State Agency Coordinator**

The state's Agency Coordinator is responsible for delegating state mission assignments, activating the state Scene Management System, establishing and maintaining the field command post, requesting and directing the use of state resources, and directing the operations of all state agencies engaged in responding to hazardous materials incidents. The state operating authority, usually the Director of the Department of Fish and Game, is responsible for selecting the State Agency Coordinator.

The Agency Coordinator acts as the primary liaison between the state and the Incident Commander. The Incident Commander assists the Coordinator in evaluating the incident within the Unified Command Structure. If the state Agency Coordinator determines that local capabilities will be or have been exceeded, he or she may assume final authority on behalf of the state. Strategic decisions are then reached within the Unified Command, approved by the State Agency Coordinator and directed to the Incident Commander who disseminates the directive throughout the Incident Command System. The State Agency Coordinator also confers with the federal On-Scene Coordinator (OSC), if the situation requires federal involvement.

### **State Operating Team**

The state operating team is composed of state agency representatives and staffs the Scene Management System. The team provides technical advice, operating personnel and equipment to the State Agency Coordinator on request, whenever the team is activated for a hazardous materials response.

### **State Agencies**

State agencies have been assigned various responsibilities for hazardous materials incidents within the state Scene Management System. Their function is to employ state resources in a manner that supports local actions.

### **California Highway Patrol**

The highway patrol is responsible under Section 2454 of the California Vehicle Code for incident command at the scene of an on-highway hazardous substance spill or disaster where the department has primary traffic investigative authority. Incident command at the scene of an on-highway hazardous substance incident means coordination of operations which occur at the location of a hazardous substance incident. This coordinating function does not include how the specialized functions provided by the various other responding agencies are to be performed. The incident commander at the scene of an on-highway hazardous substance incident shall consult with other response agencies at the scene to ensure that all appropriate resources are properly utilized, and shall perform his or her coordinating function in a manner designed to minimize the risk of death or injury to other persons. The highway patrol is responsible for coordinating state agency notification and notifies the state Office of Emergency Services on any reported hazardous materials release.

## HAZARDOUS MATERIALS ON-SCENE INCIDENT COMMANDER

materials release.

### Cal Trans

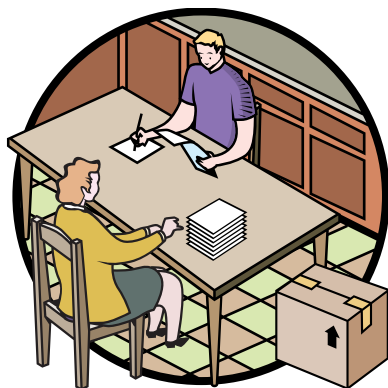
Cal Trans is responsible for assisting in identification, containment, clean-up and restoration of services for incidents occurring on State Highways. Cal Trans will not provide clean-up, unless the prevention of additional threat to public health and environment dictates the immediate clean-up of the material. Personnel should be trained to assist first responders, but they must be limited to operating within established safety zones.

### California Emergency Management Agency, (CalEMA) formerly State Office of Emergency Services 800-852-7550

The CalEMA is responsible for planning, notification, and coordination of state agency mutual aid response to hazardous materials incidents. It supports the State Agency Coordinator's request for state resources during major hazardous materials incidents and provides technical assistance and resources. The CalEMA maintains and operates a 24-hour notification center in Sacramento to coordinate emergency response communications throughout California.

### State Department of Fish and Game

The State Department of Fish and Game will provide the state's Agency Coordinator when the incident does not occur in the Highway Patrol's jurisdiction. The department provides communications, enforcement and investigative support. It also recommends remedial actions for stream or waterway contamination, assesses resources and habitat damage for pollution incidents, and activates the oil spill contingency plan for the state in the event of a threatened or actual release of oil. In addition, the department confers with or provides assistance on behalf of the state to the federal On-Scene Coordinator if federal involvement is necessary. Another of its duties is to establish criminal and civil liabilities.



### Department of Health Services

The Department of Health Services (DHS) — Toxic Substances Control Division provides technical advice on the proper handling of toxic materials at an incident site and during its removal. The DHS also *provides funding for clean-up services through the state's Super Fund.*



### **State Water Resources Control Board**

This agency provides technical assistance pertaining to the potential impact of hazardous materials incidents on water resources. It advises the Agency Coordinator of critical water use in the affected area and appropriate counter measures. The agency provides water sampling, analysis and monitoring, assists the DHS in designating a site for disposal of hazardous materials debris, utilizes statutory and regulatory authority to cause clean-up and imposes “cease and desist” or abatement orders, releases available funding for clean-up, and pursues recovery costs from the responsible parties.

### **Federal Government Responsibilities**

When a hazardous materials incident occurs on federal lands, the federal government will coordinate the response operation. When an incident occurs in local or state jurisdictions, and the nature of the response exceeds the capabilities of the State or involves multiple state jurisdictions, the federal government, usually through the Environmental Protection Agency, takes over the coordination of the response operation. Again, this does not mean that the Incident Commander will be replaced with a federal agent, nor will the Incident Command System be abandoned. However, if it deems necessary, the federal government can assume final *authority* within the confines of the Unified Command Structure and can thereby determine the final strategic plan.

As with the state structure, a federal **On-Scene Coordinator** (OSC) is appointed to ensure that appropriate actions are taken.



## Federal Agencies (not a complete listing)

### National Response Center (800) 424-8802

The National Response Center is mandated by 40 Code of Federal Regulations 300, "National Oil and Hazardous Substances Pollution Contingency Plan" and acts as the primary federal source of contact for response notifications from the public, responsible parties and all government agencies. It operates a 24-hour communications hotline to receive reports of Level II & III emergencies nation-wide. It counter-notifies the state OES, the federal On-Scene Coordinator and other state and federal agencies as appropriate for review and response determination.

### Environmental Protection Agency

The Environmental Protection Agency activates and operates the *federal response system* for hazardous materials incidents on land other than the coastal zone. It provides a federal On-Scene Coordinator, support staff and resources for a response consistent with the agency's responsibilities and authorities. It provides expert advice, advises the Regional Response Team and coordinates with state agency representatives. (Region IX in San Francisco can be reached at [415] 974-8131.) The EPA is also responsible for administering the *Federal Super Fund* account and for determining the priority of clean-up sites requiring remedial action.

### United States Coast Guard

The United States Coast Guard activates and operates the federal response system for hazardous materials incidents affecting the *navigable waterways and the coastal zone*. It provides technical assistance similar to that of the Environmental Protection Agency within its own jurisdiction. The United States Coast Guard maintains and provides specialized *Strike Teams* for hazardous materials releases. These Strike Teams are comprised of personnel who have specialized knowledge and have received training in hazardous materials emergencies. They also have at their disposal specialized sampling and monitoring instruments, containment materials and devices and specialized protective clothing.

## NOAA

The National Oceanic and Atmospheric Administration is charged with the responsibility of providing technical assistance to all federal agencies. In order to accomplish this complex task, NOAA developed a computer based chemical database and information management system called **"CAMEO"** (Computer Aided Management of Emergency Operations). This extremely useful emergency response tool is now being utilized by many fire departments and specialized Hazardous Materials Response Teams for conduction of community risk assessments and for accessing emergency response information at hazardous materials emergencies.

## Non-Government Agencies

### Poison Control and Toxic Information Centers

Regional poison control and information centers have been created throughout the United States by private industry, sponsored in part by government funding. Poison control centers provide information and assistance on exposure and medical treatment for hazardous materials. Toxic Information Centers provide emergency assistance and guidance on protection, health and safety information and preliminary hazardous materials scene management. A partial listing of the various Toxic Information sources and Poison Control Centers are provided later in this section of the manual.

### CHEMTREC - - - - 800 424-9300

The Chemical Manufacturers Association established CHEMTREC, the Chemical Transportation Emergency Center, to provide chemical information for response personnel during chemical transportation emergencies. *Transportation* is a key word here—if the chemical emergency is located in a fixed facility, CHEMTREC is **not** required to provide information, as CHEMTREC's charter specifically addresses transportation emergencies. CHEMTREC often does provide information when called about a fixed facility incident. However, it is vital to remember that CHEMTREC is designed to give information for the transportation environment—which is often very different from a fixed facility environment. Accidents to responders, including *fatalities*, have occurred due to misinformation given by CHEMTREC on fixed facility incidents.



The duty officer at CHEMTREC can provide specific information on the physical and chemical properties of the materials involved, health and safety data, including evacuation distances, neutralization, fire fighting techniques and materials, first aid, disposal, decontamination and any special instructions. The duty officer then notifies the shipper about the emergency. CHEMTREC also serves as the communications center for the private sector emergency response system and coordinates its activities with several mutual aid programs. Specialized assistance, such as provided by the Pesticide Safety Team Network and CHLOREP, can also be accessed via CHEMTREC. In order for CHEMTREC to give the correct emergency response data and advise, the caller should have the following information available.

- Products involved
  - Shipper
  - Container types
  - Rail car/truck number
- Quantity
  - Consignee
  - Location of incident
- Call back number
  - Carrier name
  - Weather conditions

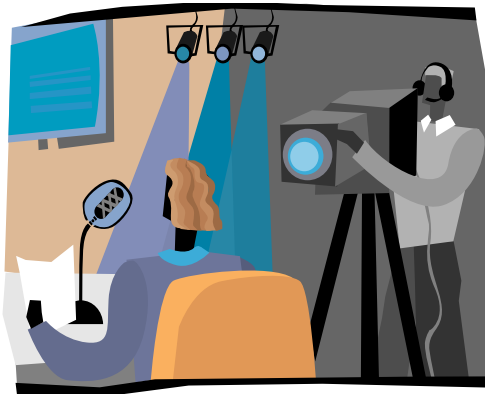
### Other Non-Government Agencies

|                                        |                                                                  |
|----------------------------------------|------------------------------------------------------------------|
| American Red Cross                     | aid evacuees with shelter and food                               |
| Civil Air Patrol                       | to aid personnel and equipment that need to be brought in by air |
| Radio Amateur Civil Emergency Services | to augment communication                                         |
| Salvation Army                         | to aid evacuees with shelter and food                            |

## Media Involvement

Under Chapter 6.6 of the Safe Drinking Water and Toxic Enforcement Act of 1986, a “designated government employee” must notify the local Board of Supervisors, local health officer *and the media* within 72 hours of the occurrence of a Level II or III hazardous materials incident (Proposition 65). It is extremely important that the Incident Commander establish a *Public Information Officer* as part of the command staff. This staff member can inform the media of the facts, and can also request that the media advise the public of the appropriate actions to take, such as to evacuate from a certain area. As the media can be the fastest means of getting information to the public in an emergency, and as much of the news media’s video film footage is used in training at the fire department, it is vital that good relations be developed and maintained.

When first responders are dispatched to a hazardous materials incident, it is not uncommon for the media to listen in on the fire radio and to arrive at the same time or before the responding units. This situation obviously creates a safety problem, because the media is trying to get the story and inform the public at the same time as the first responders are attempting to isolate the area and initiate evacuation. According to the California Penal Code 409.5, the areas around a hazardous materials incident and the command post may be closed to the public, but not to the media. However, if the event is legitimately considered to be a crime scene, such as an illegal dumping of hazardous wastes, the area may also be closed to the media for the protection of evidence. The bottom line to handling the media at an emergency incident is to achieve the situation where the media can be relied on to be a major resource and not just a major headache for Incident Command. To achieve this takes time, patience and the building of trusting relationships between the various factions. For this important reason members of the media should never be ignored, disregarded, or purposely misinformed by emergency responders.



## **Public Information Officer**

As previously discussed, while establishing the Incident Command System the Incident Commander will find it extremely beneficial to appoint a Information Officer (IO) as part of the Command Staff. The information IO is responsible for developing and releasing information about the incident to the news, to incident personnel, and to other appropriate agencies and organizations.

### **Duties:**

- √ Review Common Responsibilities.
- √ Determine from the IC if there are any limits on information release.
- √ Develop material for use in media briefings.
- √ Obtain IC's approval for media releases.
- √ Inform media and conduct media briefings.
- √ Arrange for tours and other interviews or briefings that may be required.
- √ Obtain media information that may be useful to incident planning.
- √ Maintain current information summaries and/or displays on the incident and provide information on status of incident personnel.
- √ Maintain own Unit/Activity Log (ICS 214).

## **Contingency Planning**

Due to important role the IO can play at an incident, emergency response organizations should provide for a public information component, and even establish a Public Information Team, as part of their pre-emergency planning. This should be accomplished in the following manner:

- Establish policies and procedures regarding the releasing of information, and develop media contact lists, checklists and pre-formulated messages.
- Train all personnel who might be expected to act as a IO at an incident on media interaction and the duties of a IO.
- Instigate and initiate seminars for members of the media on the aspects of hazardous materials response.
- Familiarize personnel regarding use of the various media channels, including the Emergency Broadcast System.
- Coordinate with utility companies to arrange for mobile phone bank installations at incidents.

## Unified Command Structure

The local city or county fire department is responsible for incident command, isolation and zoning, rescue (when prudent), evacuation, containment, decontamination, fire suppression, limited incident mitigation, and in some cases, for providing or acquiring the services of a specialized Hazardous Materials Response Team. The first responding officer arriving at the incident site will initially assume the role of Incident Commander, thereby activating the Incident Command System. These resource management and command responsibilities may be transferred to a more senior officer, when one arrives on-scene.

If the incident presents major complexities involving the response of other departments, agencies or jurisdictions, the Incident Commander will operate within a Unified Command Structure. This Unified Command Structure will be comprised of representatives from all agencies involved in the response. Unified Command representatives work together to pool resources and *jointly* determine incident goals, objectives and priorities. A Unified Command Structure will obviously need to be established when more than one department or agency shares *management responsibility*. However, each individual agency retains full command authority *within its own jurisdiction* at all times. Outside of the Unified Command Structure, the Incident Commander becomes the spokesperson for the group and remains at the top of the chain of command. Members of the General Staff (Operations, Planning, Logistics & Finance) as well as the Command Staff (Information, Safety & Liaison Officers) continue to report directly to the Incident Commander. The Liaison Officer is responsible for interacting with the other agencies and groups that are not directly involved in the Unified Command Structure.

The State Agency Coordinator can assume final authority on behalf of the state, if it is determined that the local capabilities have been exceeded. Furthermore, the Federal On-Scene Coordinator can preempt the State Agency Coordinator, if it is determined that the nature of the response exceeds the capabilities of the state, or involves multiple state jurisdictions. If this happens, it must be understood that the Incident Commander and the Unified Command Structure are **not** being *replaced* by the state or federal representative. The Incident Commander remains at the top of the chain of command, and the Unified Command structure continues

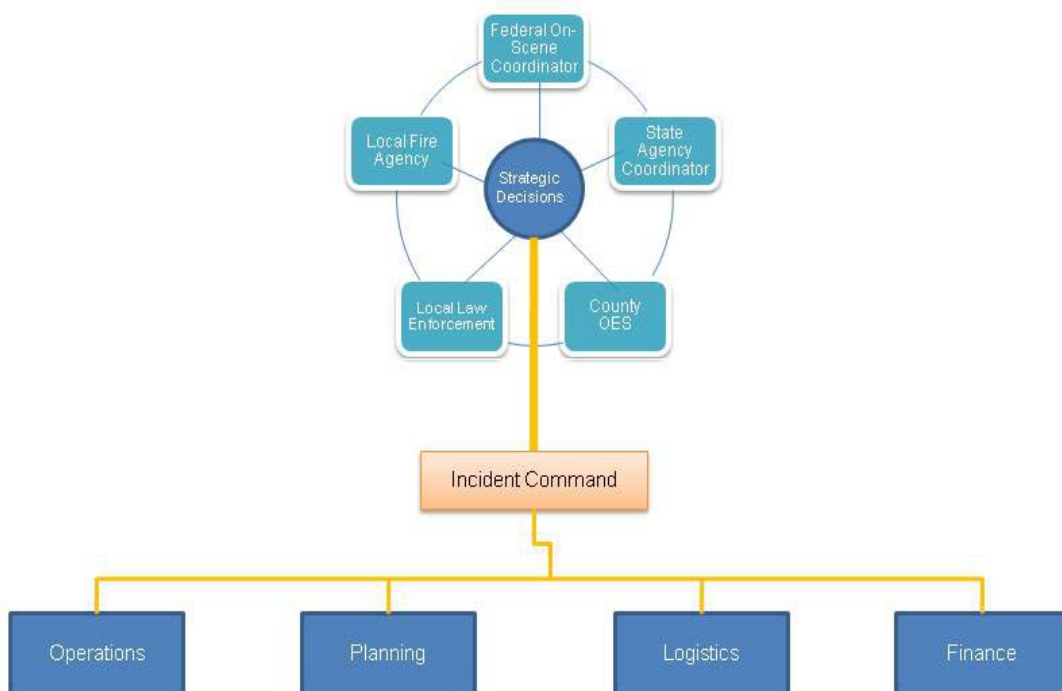


to evaluate options and come to a consensus of thought. The state or federal Coordinator is simply exercising the *final* authority to choose an option or plan that will agree with his or her agency's ultimate responsibility.

In summary, the organization of the Unified Command Structure may at first appear to be very linear, following a chain-of-command and organizational structure similar to the Incident Command System. However, in reality it becomes a very complex structure taking on a *matrix* type of management system. Unified Command operates very similarly to the Board of Directors of a major corporation. As with a Board meeting, there are people who have the right to veto, and there will be someone who has ultimate authority for final decisions. However, the emphasis is focused on achieving a consensus of opinions, joint decisions and a sharing of ideas and resources. The following illustration depicts a typical matrix organization for the management of a Unified Command Structure.

## Unified Command Structure

### MATRIX MANAGEMENT



## **Emergency Telephone Numbers and Websites for Haz/Mat Incidents**

The following telephone numbers and websites were verified by Emergency Training Services, Inc. in November 2007. You should augment our list with local and regional contacts that you have developed.

### **California State Agencies**

State Office of Emergency Services

Website: [www.oes.ca.gov](http://www.oes.ca.gov)

Main Number: 1 (916) 845-8510

California Department of Transportation  
CALTRANS

WebSite: [www.caltrans.ca.gov](http://www.caltrans.ca.gov)

General Information Number 1 (916) 645-5266

California Department of Public Health

Website: [www.dhcs.ca.gov](http://www.dhcs.ca.gov)

Recorded Safety Information referral line 1 (800) 550-5234

Recorded Information form the CDC 1 (800) CDC-INFO

### **Local Agencies**

County Office of Emergency Services as well as Local Health Services (Local Emergency Medical Services LEMSAs) Agencies.

All local county agencies within the State of California have websites. We strongly recommend that you check their websites and phone numbers for your local and regional use.

### **Federal Agencies**

Environmental Protection Agency (EPA) 1 (800) 424-8802

For other Federal Resources such as the Centers for Disease Control and Prevention (CDC), Homeland Security (DHS) or the Federal Emergency Management Agency (FEMA) we suggest that you go to the California Department of Public Health's website. They have a [resources link](#) to all appropriate Federal and State Agencies.

## **Chemical Hazard Information**

|                       |                  |
|-----------------------|------------------|
| CHEMTREC              | 1 (800) 424-9300 |
| TOX-CENTER            | 1 (800) 682-9000 |
| NORTHRIDGE TOX-CENTER | 1 (818) 885-8500 |
| POISON CONTROL CENTER | 1 (800) 662-9886 |

## **Other Information Sources**

The following is a list of sources that may be of assistance. We suggest that you fill in the spaces provided with numbers and websites that are appropriate for your location.

### **Aircraft Emergencies**

|                                 |                  |
|---------------------------------|------------------|
| Federal Aviation Administration | _____            |
| Sacramento, California          | _____            |
| San Jose, California            | 1 (408) 291-7681 |
| San Diego, California           | _____            |

### **Biological Agents**

|                                                                                 |                  |
|---------------------------------------------------------------------------------|------------------|
| Center for Disease Control<br>Atlanta, CA (Mandatory for<br>Etiological Agents) | 1 (404) 633-5313 |
|---------------------------------------------------------------------------------|------------------|

### **Chemical Companies**

|                               |       |
|-------------------------------|-------|
| Chevron Chemical Company      | _____ |
| Dow Chemical Company          | _____ |
| DuPont Chemical Company       | _____ |
| Shell Chemical Company        | _____ |
| Other Companies call CHEMTREC |       |

### **Chlorine**

|                                        |                |
|----------------------------------------|----------------|
| Chlorine Institute                     | 1-212-682-4324 |
| Other gas Institutes and organizations | _____          |
| LOC Institute                          | _____          |

### **Explosives**

|                             |       |
|-----------------------------|-------|
| Department of Defense (DOD) | _____ |
| Local Law Enforcement       | _____ |
| Demolition Contractors      | _____ |

### **Railroad Incidents**

|                                                     |                                                                      |
|-----------------------------------------------------|----------------------------------------------------------------------|
| Union Pacific Local Yardmaster                      | _____                                                                |
| National Operations Center                          | _____                                                                |
| AMTRACK California<br>(California Division of Rail) | _____                                                                |
| Website:                                            | <a href="http://www.dot.ca.gov/rail/dor">www.dot.ca.gov/rail/dor</a> |

### **Toxic Materials / Pesticides**

|                                       |                  |
|---------------------------------------|------------------|
| Santa Clara Co. Poison Control Center | 1 (800) 662-9886 |
| Local Regional Poison Control Center  | _____            |
| Pesticide Safety Team Network (PSTN)  | CHEMTREC         |

### **Laboratory Facilities**

|                         |       |
|-------------------------|-------|
| Your Local Laboratories | _____ |
|                         | _____ |
|                         | _____ |

### **Miscellaneous Numbers (Local, Regional, State, Federal)**

\_\_\_\_\_

### ADDITIONAL TELEPHONE REFERENCES & NOTES

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## **Group Exercise Session #3**

The following group exercises are intended to reenforce the main points presented in the text, and to provide the student with the opportunity to demonstrate competency in notification procedures and the implementation of local, state, and federal emergency response plans. The first exercise in the session has been completed in full to demonstrate what is to be expected from the student. The second exercise is to be completed in a study group format. At the conclusion of this session, a five (5) minute presentation containing an overview of each group's findings will be delivered by a representative from each of the groups.

## **Agency Notification & Involvement Check Sheet**

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### **Scenario #1**

Using the **Scenario #1** map located at the end of the Hazard Assessment chapter, determine the following:

- 1) Which local, state, federal, and non-government agencies should be notified
- 2) What type of response can be expected from each of the agencies notified
- 3) What role will each individual agency be expected to play in the incident.

Draw a matrix depicting the probable unified command structure that should be developed for the incident.

---

#### **Agency notified**

#### **expected response & Role**

#### **Local Police Department**

Respond to Scene. Responsible for evacuating downwind areas and providing traffic control for incident isolation and scene security.

#### **Agency notified**

#### **expected response & Role**

#### **Local County Office of Emergency Services**

Telephone standby. Responsible for notifying other state and federal agencies as appropriate, establishing a communications network and providing resources as needed.

#### **Agency notified**

#### **expected response & Role**

#### **Local Environmental Health Department**

Respond to scene. Responsible for safeguarding public health, providing technical advise to incident command, monitoring clean-up and declaring incident site free of contamination.



## Agency Notification & Involvement Check Sheet

Page 2 of 2

**Agency notified**

**County Agricultural Commissioner**

**expected response & Role**

Respond to scene. Responsible for providing technical advisement to incident command regarding pesticides and monitoring clean-up. Should be contacted if pesticides are involved.

**Agency notified**

**Air Pollution Control District**

**expected response & Role**

Telephone standby. Responsible for providing technical advisement to incident command regarding airborne pollutants. Must be notified if pesticide fire is to be allowed to burn out.

**Agency notified**

**State Office of Emergency Services**

**expected response & Role**

Telephone standby (may send representative from Dept. of Fish and Game). Responsible for advisement to local OES and to provide resources and technical expertise as needed.

**Draw Matrix Here**

Agency Notification &  
Involvement Check Sheet

Scenario #2

Using the **Scenario #2** information presented at the end of the Hazard Assessment chapter and the map of Santa Luisa, determine the following:

1) Which local, state, federal, and non-government agencies should be notified

2) What type of response can be expected from each of the agencies notified

3) What role will each individual agency be expected to play in the incident.

Draw a matrix depicting the probable unified command structure that should be developed for the incident.

Agency notified

expected response & Role

Agency notified

expected response & RoLe

Agency notified

expected response & Role

## Agency Notification & Involvement Check Sheet

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Agency notified

expected response & Role

Agency notified

expected response & Role

Agency notified

expected response & Role

Agency notified

expected response & Role

Agency notified

expected response & Role

**HAZARDOUS MATERIALS ON-SCENE  
INCIDENT COMMANDER**

Agency notified \_\_\_\_\_

expected response & Role \_\_\_\_\_

\_\_\_\_\_

Agency notified \_\_\_\_\_

expected response & Rol \_\_\_\_\_

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Agency notified \_\_\_\_\_

expected response & Role \_\_\_\_\_

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expected response & Role \_\_\_\_\_

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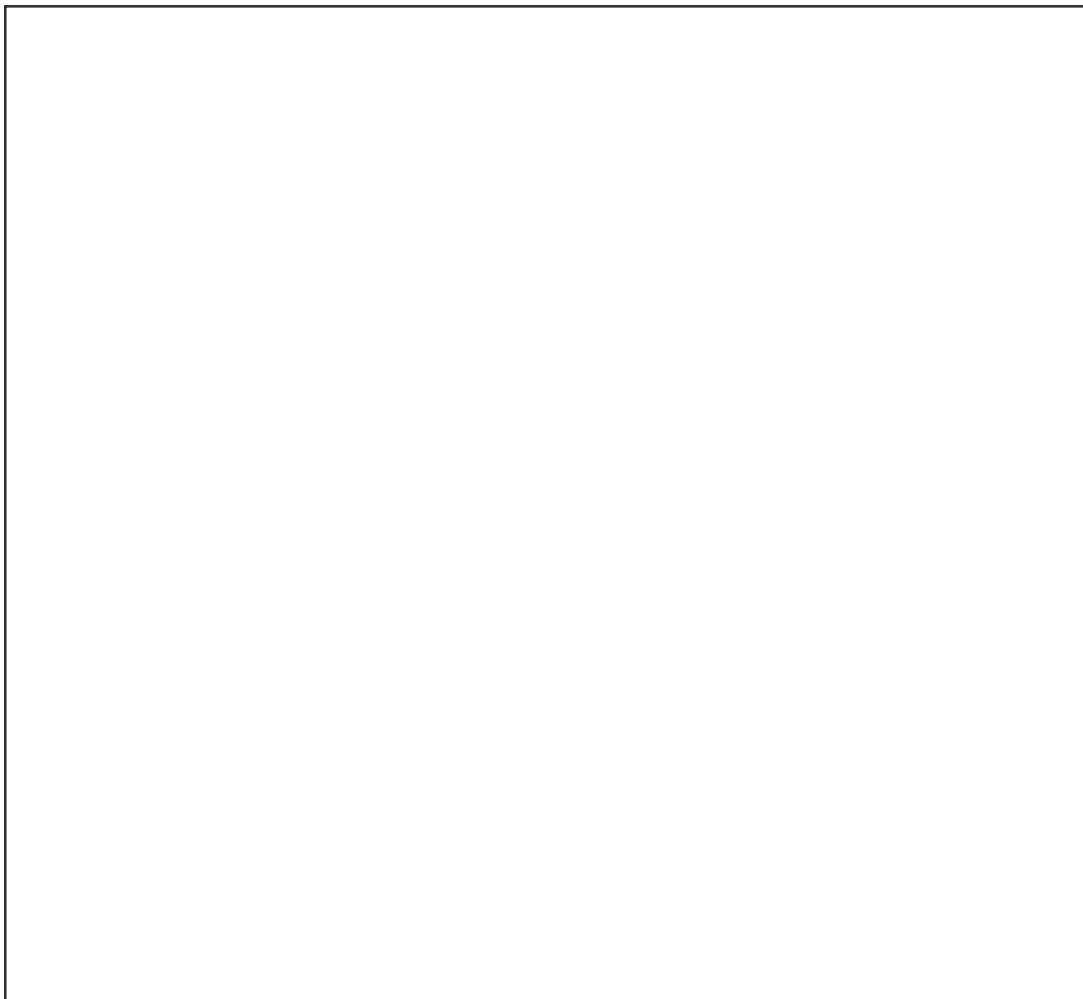
**Agency notified**

**expected response & Role**

**Agency notified**

**expected response & Role**

Draw a matrix depicting the probable unified command structure that should be developed for the incident.



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# Site Control, Site Entry, & Containment Operations

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On completion of this chapter the student will be able to:

1. *Describe* the criteria necessary in establishing site-control measures and in determining work zones for the safety of response personnel.
2. *Describe* the various considerations for sheltering people from a hazardous materials release and demonstrate competency in initiating an evacuation contingency plan.
3. *Describe* the personal precautions to be taken and the procedures to be followed for making a safe entry into an exclusionary zone.
4. *Describe* the hazards and risks associated with personnel operating in specialized protective clothing and equipment.
5. *Recite* the EPA requirements for the four (4) levels of personal protection and describe the criteria used to determine the appropriate level of protection.
6. *Describe* the various methods used to contain releases of hazardous materials.



## Background

Once the initial hazard assessment has been completed, the necessary resources have been requested, and the appropriate agencies have been notified, Incident Command can then take the protective measures needed to prevent further harm to the public and to the environment. The degree to which protective measures, or any operations intended to mitigate the incident—can be performed will depend on the type of hazardous materials involved in the incident, the type of protective equipment available to the responders, and the level of training of the personnel. The hazardous nature of the chemicals involved in the incident may create the situation in which certain tactical priorities, such as rescue and the delivery of medical treatment, may have to be delayed until specialized equipment or assistance is brought to the incident scene. However, protective measures, such as scene isolation and localized evacuation, can usually be initiated immediately by the first-arriving units in the most hazardous of situations. *It should be the primary objective of initial responders to establish site-control measures that will allow personnel to perform their duties safely within the limits of their protective equipment and training.*

Under OSHA's Final Rule regarding hazardous materials response training it is **not** expected that Incident Commanders will have the same degree of competency and specialized knowledge as a hazardous materials technician. However, the federal mandate does specify that personnel who may be expected to command an incident must know the risks associated with employees working in specialized protective clothing. They must also have an understanding of the standard operating procedures required to control, mitigate, and terminate an incident. In an effort to achieve compliance with OSHA's training and competency requirements for on-scene incident commanders, the following section of this course offers an overview of the following sub-topics:

- ✓ **SITE-CONTROL MEASURES**
- ✓ **CONSIDERATIONS FOR RESCUE**
- ✓ **MANDATORY EVACUATION**
- ✓ **ADVISORY EVACUATION**
- ✓ **SHELTERING PEOPLE IN PLACE**
- ✓ **CALCULATING EVACUATION PARAMETERS**
- ✓ **EVACUATION PLANNING**
- ✓ **STANDARD OPERATION PROCEDURES FOR SITEENTRY**
- ✓ **RISKS ASSOCIATED WITH PROTECTIVE CLOTHING**

- ✓ **TYPES OF PROTECTIVE CLOTHING**
- ✓ **EPA LEVELS OF PROTECTION**
- ✓ **TYPES OF CONTAINMENT**

## **Site-Control Measures**

On arrival at the incident scene the first arriving units should **isolate and deny entry** to the immediate area. Performing this vital function not only prevents the public from becoming exposed to hazardous substances, it also serves to prevent other responding units from getting too close to an incident. Remember, the first arriving units at the scene can “make or break” an incident by their initial actions. If emergency responders allow themselves to become contaminated, they will become part of the problem and will not be able to perform their assigned duties. Initial isolation of an incident scene can be accomplished by using response apparatus to shut off a city street or block the access into a facility. However, if response vehicles are used for this purpose, they must not be exposed to flammable gases as they provide a ready source of ignition. Furthermore, vehicles also provide a source of fuel and therefore must not be exposed to oxidizing atmospheres (diesel engines have been known to run out of control and even explode when exposed to oxygen-enriched atmospheres). Law enforcement personnel can be requested to assist in the isolation of an area by blocking-off access routes into the incident scene. In California, the legal right of a Peace Officer to close an area to the public is covered under section 409.5 of the Penal Code.

Once initial isolation has been established, the Incident Commander should then establish a physical perimeter surrounding the incident scene. Entry into this area should only be made by personnel wearing the appropriate protective clothing. Creating this perimeter can be accomplished by using barricade tape, cones, and other such restricting barriers. However, because many hazardous substances have flammable and combustible properties, road flares must obviously not be used for this purpose.

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...first arriving units at the scene can “make or break” an incident by their initial actions.

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If the substance(s) involved in an incident cannot be readily identified by traditional means, isolation zones should be established using a greater margin of safety.

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When dealing with materials that can be readily identified, through such mediums as placards and labels, determination of the actual distances to be isolated can be a relatively easy task to accomplish. Many reference books and information sources contain guidelines as to how many feet in all directions should be isolated from a particular chemical. For instance, the Department of Transportation Emergency Response Guidebook (DOT ERG) lists isolation/evacuation distance tables for selected chemicals in the rear section of the book. Additionally, the computerized "CAMEO" information system can be used to calculate the necessary isolation and evacuation distances (using air plume models), either from the information supplied by a remote air/wind monitoring station or from information entered manually on the computer's keyboard.

If the substance(s) involved in an incident cannot be readily identified by traditional means, isolation zones should be established using a greater margin of safety. Making an assessment of the incident scene and discovering how the materials are reacting will certainly aid in determining safe isolation distances. For instance, if the situation occurs in which a spilled substance is producing fuming vapors, or is otherwise spreading to other areas, then a larger isolation distance will be necessary than for a situation in which the material appears stable and remaining static. Obviously, if there is any indication of damage to plant life or injury to people and animals, then a relatively large isolation perimeter will need to be established. Air monitoring instruments, combustible gas detectors, and radiological survey meters should be used to determine the presence of harmful substances and when available they should be used to estimate the perimeters of exclusionary zones and other work safety zones.

## **Work Zones**

The following description and illustration of the three (3) recommended work areas has been taken directly from EPA Training Materials (EPA 165.5):

One method of preventing or reducing the migration of contaminants is to delineate zones on the site in which prescribed operations occur. Movement of personnel and equipment between zones and onto the site itself should be controlled and monitored by access control points. The Environmental Protection Administration recommends that the following three (3) contiguous zones be established:

- 1. EXCLUSION ZONE (HOT ZONE)**
- 2. CONTAMINATION REDUCTION ZONE (WARM ZONE)**
- 3. SUPPORT ZONE (COLD ZONE)**

***Exclusion Zone (Hot):***

The Exclusion Zone, the innermost of the three areas, is the physical area where contamination does or could occur. All people entering the Exclusion Zone must wear prescribed Levels of Protection. Entry and exit check points must be established at the periphery of the Exclusion Zone to regulate the flow of personnel and equipment into and out of the zone and to verify that the procedures established to enter and exit are followed.

The outer boundary of Zone 1, the Hotline, is initially established by visually surveying the immediate vicinity of the incident and determining where the hazardous substances involved are located; where any drainage, leachate, or spilled material is; and whether any discolorations are visible. Guidance in determining the boundaries is also provided by data from the initial site survey indicating the presence of organic or inorganic vapors/gases or particulates in air, combustible gases, and radiation, or the results of water and soil sampling.

Additional factors that should be considered include the distances needed to prevent fire or an explosion from affecting personnel outside the zone, the physical area necessary to conduct site operations, and the potential for contaminants to be blown from the area. Once the Hotline has been determined it should be physically secured, fenced, or well-defined by landmarks. During subsequent site operations, the boundary may be modified and adjusted as more information becomes available.

***Subareas Within the Exclusion Zone:***

All personnel within the Exclusion Zone must wear the required Level of Protection. Personnel protective equipment is designed based on site-specific conditions and the hazards that might be encountered. Frequently within the Exclusion Zone, different Levels of Protection are justified. Subareas are specifically and conspicuously marked as to whether Level A, B, or C protection is required. The Level of Protection is determined by the measured concentration, and the known or suspected presence of toxic substances.

The job assignment or type of work to be done might also dictate the Levels of Protection to be worn. For example, collecting samples from open containers might require Level B protection, while for walk-through ambient air monitoring, Level C protection might be sufficient. The assignment, when appropriate, of different Levels of Protection within the Exclusion Zone generally makes for a more flexible, effective, and less costly operation while still maintaining a high degree of safety.

***Contamination Reduction Zone (Warm):***

Between the Exclusion Zone and the Support Zone is the Contamination Reduction Zone which provides a transition between contaminated and clean zones. This zone serves as a buffer to further reduce the probability of the clean zone becoming contaminated or being affected by other existing hazards. It provides additional assurance that the physical transfer of contaminated substances on people, equipment, or in the air is limited through a combination of decontamination, distance between the Exclusion Zones, air dilution, zone restrictions and work functions.

Initially, the Contamination Reduction Zone is considered a non-contaminated area, at the boundary between the Exclusion and Contamination Reduction Zones, contamination reduction corridors (consisting of an appropriate number of decontamination stations) are established, one for personnel and one for heavy equipment. Depending on the size of the operation, more than two corridors may be necessary. Exit from the Exclusion Zone is made through the Contamination Reduction Corridor. As operations proceed, the area around the decontamination station may become contaminated, but to a lesser degree than the Exclusion Zone. On a relative basis, the amount of contaminants should decrease from the Hotline to the Support Zone due to the distance involved and the decontamination procedures used.

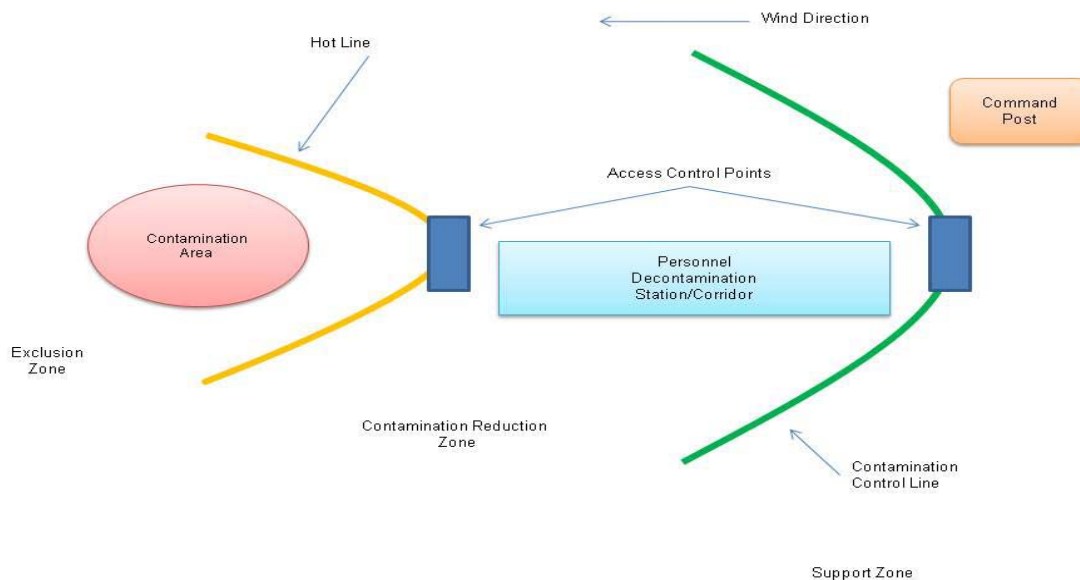
The boundary between the Support Zone and the Contamination Reduction Zone, the Contamination Control Line, separates the possibly low contamination area from the clean Support Zone. Access to the Contamination Reduction zone from the Support Zone is through a control point. Personnel entering this zone should wear the prescribed personnel protective equipment, if required, for working in the Contamination Reduction zone. Entering the Support Zone requires the removal of any protective equipment worn in the Contamination Reduction Zone.

### ***Support Zone (Cold):***

The Support Zone, the outermost part of the site, is considered a non-contaminated or clean area. Support equipment (Command Post, equipment trailer, etc.) is located in this zone; traffic is restricted to authorized response personnel. Since normal work clothes are appropriate within this zone, potentially contaminated personnel clothing, equipment and samples are not permitted, but are left in the Contamination Reduction Zone until they are decontaminated.

The location of the support facilities in the Support Zone depends on a number of factors, including:

- √ Accessibility (topography, open spaces, location of transportation routes etc.)
- √ Wind Direction (Support Zone to be located upwind of Exclusion Zone)
- √ Resources Available (adequate roads, water supply, shelter, power lines etc.)



## Rescue Efforts

Rescue—specifically in regard to hazardous materials incidents—can be defined as an operation intended to bring assistance to people that have either become injured, trapped, or contaminated by the release of a hazardous substance. Whereas, evacuation can best be defined as the systematic removal of people from an area that is being threatened by a hazardous materials release. Rescue operations require a different approach than evacuation operations because rescue attempts require personnel conducting the operation to be in the appropriate Level of Protection for the hazards present. Furthermore, the people being rescued may require extrication, medical treatment, and/or decontamination.

Rescue has traditionally been the first operational priority of emergency responders for many years. However, in hazardous materials emergencies, the rescue of injured people may have to be delayed in order to save the lives of many others. Incident Commanders must be aware that situations can occur where it is impossible to perform rescue operations in a manner that is totally safe for both the rescuers and the people to be rescued. The poisonous nature and skin absorption qualities of many chemicals may require that special chemically resistant clothing be obtained and decontamination measures established before any rescue efforts can be attempted. Moreover, a large release of a hazardous material may present a major hazard to other people in the immediate vicinity and downwind areas. The removal of the people could well become the main operational priority. There may **not** be sufficient resources available to perform a time-consuming rescue as well as conduct a localized evacuation at the same time. *Whenever decisions have to be made to delay rescue efforts, Incident Command should record and document the reason for the delay, specifying exactly what rationale was used for the decision.*

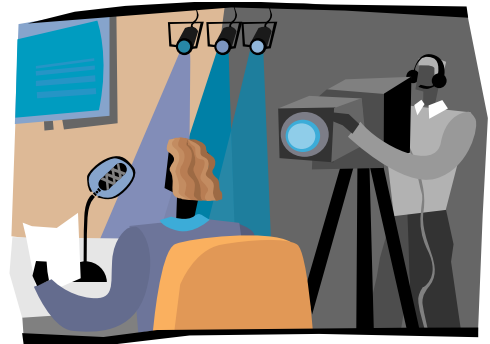


## MANDATORY EVACUATION

Due to the extreme danger presented to the public by hazardous materials incidents, it may become necessary to remove people from their homes and businesses for the duration of the emergency. It is the Incident Commander's responsibility to assess the hazards presented by an incident and to determine if an evacuation of the threatened area is, in fact, necessary. If a released material is moving rapidly, or is producing toxic, corrosive, or flammable vapors, the



first arriving Officer may have to order the immediate emergency evacuation of the threatened area. However, in order to protect the *constitutional rights* of private citizens, the ordering of a mandatory evacuation of this nature should only be done when the urgency created by the emergency makes it necessary. The authority to close an area to the public is covered by the Penal Code section 409.5 which also covers the restriction of sightseeing at disaster scenes. However, it is important for Incident Command to be aware that a note at the end of Penal Code section 409.5 states that: “Nothing in this section shall prevent a duly authorized representative of any news service, newspaper, or radio or television station or network from entering the area closed pursuant to this section.” As this specifically states that members of the news media cannot be excluded from a threatened area, Incident Command should consider providing a safe refuge for these people and providing them with the information necessary to perform their task of reporting the facts. Remember, television and radio stations can become a major resource for Incident Command while evacuating a large area. It is far better to develop a good working relationship with the news media, rather than alienate them or allow them to become part of the problem.



In order to actually carry out the evacuation of downwind or downgrade areas, assistance should be obtained from law enforcement agencies. However, it is important to realize that personnel conducting an evacuation must not be allowed to be exposed to harmful substances at or above the “Immediately Dangerous to Life and Health” level (IDLH). Public address systems on response vehicles and battery-operated portable megaphones can be used to supplement the door-to-door method of notifying people of mandatory evacuation. People should be given specific evacuation instructions, as well as the location of relocation shelters.

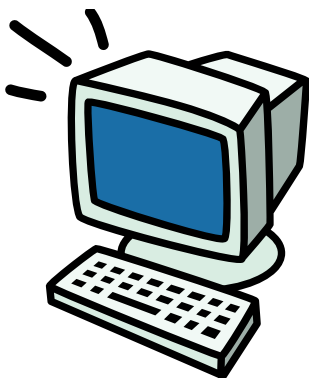
If occupants refuse to leave an area after being notified of a mandatory evacuation, it would be questionable judgement to force the issue. If verbal persuasion proves futile, then the name and address of the person(s) refusing to leave should be documented or relayed to the Command Post. It is important to realize that, while time is being wasted with someone who is refusing your help, the needs of someone else may become neglected.

### Advisory Evacuation

When the need for evacuation is not considered urgent, it is advisable for Incident Command to initiate an advisory, or voluntary, evacuation of the surrounding area. This advisory warning ensures that local residents and businesses are aware of any potential threats presented by an emergency and also provides them with the opportunity to leave the area on a voluntary basis. Initiating an advisory evacuation will provide Incident Command with the necessary margin of safety needed to operate at an incident, while at the same time, **not** denying the constitutional rights of the citizens unnecessarily.

### Sheltering People in Place

There are many situations in which it may become necessary to protect people in place and not actually evacuate them from occupancies. For instance, if people would have to be brought out through a hazardous vapor cloud in order to be evacuated, it may be best to have them stay inside, close all doors and windows, shut off all sources of ignition and shut down heating, ventilation and air conditioning systems (HVAC). Also, as the dispersion plumes of chemicals may contain levels of substances above the IDLH level, the area may be too dangerous for personnel to enter without wearing appropriate protective clothing. If this situation occurs, this part of the evacuation obviously becomes a *rescue* situation which will not only require the use of appropriate protective clothing, but will also need to be accompanied by decontamination procedures and the appropriate medical treatment. An accounting system should be established to record contacts made with each occupancy and to inventory the people being protected.



### Calculating Evacuation Parameters

As with calculating isolation distances, there are many available reference sources that can provide information as to how far in width and length an area should be evacuated for releases of specific chemicals. Unfortunately, most of these reference sources do not take into consideration the actual rate of release of the chemical, the topography of the area involved, or the variations in wind speed and direction. Therefore, the information provided by these sources is not very accurate and should only be used as a rough guideline. However, there are some computer based systems, such as the National Oceanic and Atmospheric Administration's "CAMEO" system, that can utilize information regarding the various

modifying factors to give a much more accurate representation of chemical plume being generated. This information can be input into the computer either by a remote air monitoring station or by direct input on the keyboard. The shape of the anticipated chemical dispersion plume can be projected on a street map showing the actual direction and extent of the area to be evacuated. The following is a list of the atmospheric conditions that should be addressed when determining evacuation distances when using a computerized dispersion modeling program:

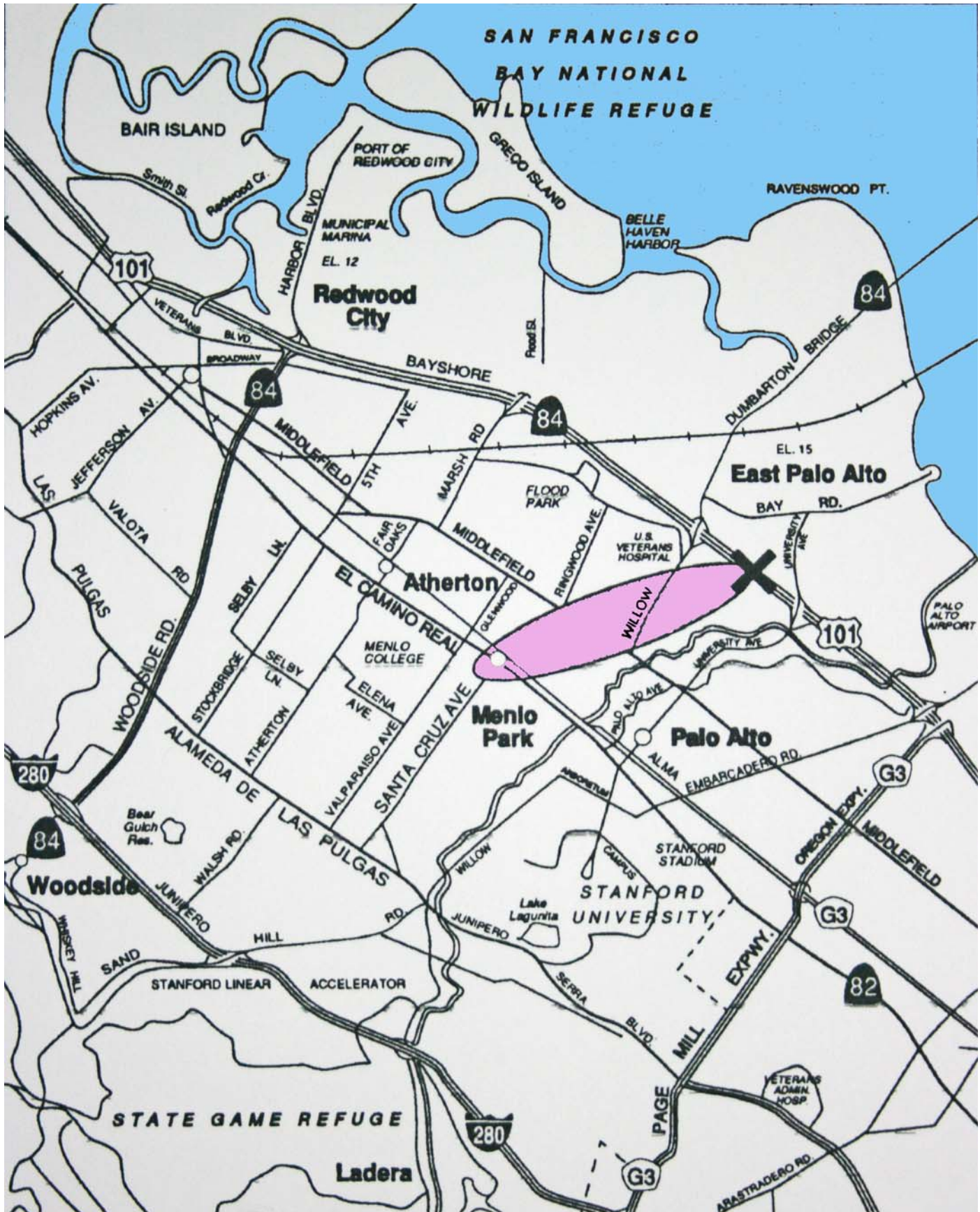
- ✓ Wind speed and direction
- ✓ Ambient temperature
- ✓ Moisture (precipitation, humidity)
- ✓ Inversion conditions
- ✓ Time of day
- ✓ Topography of the area

If reference books are to be the only source used to determine evacuation distances, it is recommended that clear plastic evacuation templates be pre-made for all of the chemicals that are known to be used, stored, or transported throughout the local area. These templates can be used to determine approximate evacuation distances in an emergency by having them overlaid on area maps of the same scale. The illustration on the following page demonstrates the usage of evacuation overlay templates for an emergency involving the release of the chemical Methyl Mercaptan.

## Evacuation Planning

Conducting an evacuation in a haphazard manner can produce very dangerous consequences for citizens and response personnel alike. Therefore, contingency plans should be drafted in anticipation of such an event. Effective evacuation planning requires the involvement and cooperation of many agencies, including law enforcement, ambulance personnel, the American Red Cross and other civil preparedness personnel.

HAZARDOUS MATERIALS ON-SCENE  
INCIDENT COMMANDER



A good evacuation plan should contain the following ten elements:

#### **Evacuation Plan Elements**

1. Procedures to ensure coordination with all agencies involved
2. Methods to determine actual area(s) to be evacuated
3. Pre-determined transportation routes through which to evacuate people
4. Procedures for controlling traffic and major transportation routes
5. Pre-identified shelters to care for evacuees
6. Methods to evacuate people without personal transportation
7. Procedures for evacuating people from specific institutions (schools, hospitals, nursing homes, jails, etc.)
8. Procedures for communicating with non-English speaking persons
9. Methods to maintain security of evacuated area
10. Procedures for lifting evacuation order and returning evacuees to their homes

In order to assist in the planning process, the following information was collated from a study conducted by the EPA of the disasters requiring evacuation between 1960 and 1973 (they still hold true):

- ✓ As the population density decreases, the evacuation time increases due to the scattering of people.
- ✓ Most evacuees utilize their own personal transportation during an evacuation and assume the responsibility of acquiring food and shelter for themselves.
- ✓ Approximately 2500 autos per lane per hour can be accommodated on most roads.
- ✓ Surprisingly little panic or hysteria was observed in the evacuations studied.



The EPA report also identified many of the problems encountered during the evacuations studied. Having an awareness of these factors allows emergency response personnel to pre-plan and develop contingencies to deal with problems in the planning process. The following is a list of the most commonly encountered problems identified in the study:

- ✓ Traffic congestion
- ✓ Bottlenecks caused by the rush to fuel private vehicles
- ✓ Rushes to stock up on food and supplies
- ✓ Security problems (looters)
- ✓ People reluctant to leave area
- ✓ Problems distributing information to evacuees
- ✓ Problems caused by sightseeing aircraft over area
- ✓ Breakdown of private vehicles
- ✓ Communication breakdown with non-English speaking people
- ✓ Logistical problems caused by an over-response of volunteers
- ✓ Inability to account for the evacuees, since relatively few people used the evacuation shelters provided
- ✓ Problems with the evacuation of special facilities, such as hospitals, nursing homes, schools and penal institutions

## Site Entry Procedures

Before entry is made into the exclusionary zone, and before any intervention measures are taken at a hazardous materials spill, Incident Command should first determine what the effects of natural stabilization would be. In other words, what would happen if the spilled material was left undisturbed by the emergency responders? All too often, incorrect actions are taken by emergency responders because they felt that something had to be done. ***A thorough risk assessment must always be made and decontamination facilities must be established before site entry is attempted.*** This should not only be performed to ensure the safety of personnel but also to determine if the benefits are worth the risks involved. However, there will obviously be occasions where entry into the

exclusionary zone will be not only beneficial, but also paramount to resolving the emergency. Given the proper conditions, entry could be made into the exclusionary zone for the following purposes:

1. effecting rescues
2. shutting off product flows
3. stopping leaks, containing spilled materials
4. atmospheric monitoring
5. gathering of samples
6. absorbing spilled substances
7. site restoration

When entry is deemed necessary at an incident, standard operating procedures and safety practices should be strictly followed to ensure the safety of the response personnel. The following list is an overview of the various personal safety precautions that should be followed during site entry operations:

## **Personal Precautions**

1. Never eat, drink, smoke, chew or perform any action that increases the probability of hand-to-mouth transfer and ingestion of poisonous substances.
2. When necessary, adhere to standard decontamination procedures.
3. Wash hands and face thoroughly whenever leaving the work zones.
4. Facial hair must not be allowed to interfere with the satisfactory fit of the mask-to-face seal of respirators and positive pressure self contained breathing apparatus.
5. Contact with contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, kneel on the ground, lean or sit on any surface that may be contaminated.

## **Site Safety Plan**

To ensure that personnel will conform to standard operating safety procedures and safe operating practices, a site safety plan should be developed, with input from the safety officer and Haz/Mat Safety, for all phases of the operation. All personnel should be made familiar with this safety plan through briefings and whenever possible, it should be written and posted. As a minimum, the site safety plan must:

### **SITE SAFETY PLAN ELEMENTS**

- Evaluate the risks associated with the operations to be conducted
- Identify key personnel to ensure incident safety
- Address levels of personal protective clothing and equipment
- Designate the boundaries of the various work areas
- Establish decontamination procedures for personnel and equipment
- Determine, control, and monitor the number of personnel operating within designated work zones
- Establish emergency procedures (i.e. escape routes, communications, Back-up Teams, hand signals etc.)
- Notify nearest medical facility and arrange for emergency care of potential toxicological problems
- Implement a program for periodic air sampling and personnel monitoring



## Safety Key Points

It is the duty of the designated Haz Mat Safety Officer to ensure that the site safety plan is followed and that safe operating practices are adhered to. Moreover, the Safety Officer must monitor all operations to make sure that they conform to the established standard operating procedures. The following list contains the operational key points that Safety Officers should check before, during and after site-entry operations:

- √ All personnel entering work zones must be adequately trained and briefed as to the practices to be followed in the site safety plan.
- √ The team and buddy system concept must be used while personnel are working in hazardous atmospheres.
- √ A suitably equipped backup team must be on stand-by to support the initial entry team.
- √ Visual contact should be maintained between entry teams, backup teams, and designated safety personnel.
- √ Access control points to exclusionary zones must be designated and emergency escape routes delineated.
- √ Communications using radios, hand signals, signs, or other means must be established and maintained between all team members. Emergency communications should be prearranged in case of radio failures.
- √ Wind indicators should be strategically placed so that they are visible to all personnel.
- √ Personnel operating in work zones should be kept to the minimum level required for safe operations.
- √ Procedures for leaving a contaminated area, including personal decontamination, must be established prior to entry into the exclusionary zone.
- √ An Incident Command System must be established and adhered to in order to maintain effective and safe operations.

## **Requirements for Protective Clothing**

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...although Incident Commanders are not expected to have the same level of knowledge, training and experience as a hazardous materials technician, OSHA's Final Rule (29 CFR 1910.120) requires that they know the hazards and risks associated with specialized protective clothing.

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The chemical and physical properties of the materials involved in an incident and the performance expected from the wearer will determine the requirements for a responder's level of protective clothing. These protective levels can range from work overalls, hard hat and boots to the fully encapsulated chemical resistant specialized clothing (Level A protection). All members of a response team must be aware of the capabilities and limitations of the personal protective clothing they will be expected to wear. Moreover, although Incident Commanders are not expected to have the same level of knowledge, training and experience as a hazardous materials technician, OSHA's Final Rule (29 CFR 1910.120) requires that they know the hazards and risks associated with specialized protective clothing. This basic knowledge should include an understanding of the rationale behind the selection of protective clothing and also an awareness of the physiological and psychological stress imposed by this type of equipment on personnel.

### **Physiological and Psychological Stressors**

The use of protective clothing and breathing apparatus increases heat and physical stress on the wearer. Specialized chemical resistant clothing greatly reduces body ventilation and diminishes its ability to regulate increases in temperature. Even in moderate ambient temperatures, the diminished capacity to dissipate heat can result in one or more heat-related medical disorders, such as heat rash, heat cramps, heat exhaustion and heat stroke. In order to reduce heat stress, the incident site safety plan should include the following five considerations:

1. Provide plenty of liquids to replace body fluids
2. Provide cooling devices to aid natural body ventilation
3. Provide mobile showers or hose-down facilities to reduce body temperature and cool protective clothing
4. In hot weather, conduct non-emergency response operations in the early morning or evening, or rotate work crews
5. Ensure that adequate shelter is available to protect personnel against extreme weather conditions

Fully encapsulated protective clothing is heavy, cumbersome, interferes with normal vision, is fatiguing to wear and also decreases the dexterity and agility of the wearer. The extra layering of materials and the feeling of confinement produced by these specialized chemically-resistant suits can also cause varying degrees of anxiety and claustrophobia to the wearer. These factors all increase physical and mental stress and the potential for accidents to occur. In order to reduce the potential for abnormal physical or mental stress, Haz Mat Team members should be periodically examined by a medical authority to determine if they are physically and psychologically fit to perform their duty. Team members should also have continual practice and training in the use of positive pressure self-contained breathing apparatus and chemical resistant protective clothing.

### **Types of Protective Clothing**

It is important for Incident Command to be aware that no one type of protective clothing will satisfy the needs of emergency responders for all situations at an emergency incident. In fact, there are three major classes of protective clothing available for use by emergency responders:

- ✓ **STRUCTURAL FIREFIGHTING CLOTHING**
- ✓ **SPECIALIZED HIGH TEMPERATURE**
- ✓ **CHEMICAL RESISTANT CLOTHING**

These three major classes can be further divided into various sub-classes, and each of these will be discussed later in this section. However, due to the diversity of the materials that can be encountered at hazardous materials incidents, and the complexity of the various situations, the process of selecting the appropriate protective clothing for emergency response personnel is an area of great concern, confusion, and controversy. One of the reasons for this dilemma is that most of the reference sources used by emergency personnel only recommend the use of “full protective equipment” (structural) or “specialized protective equipment” (chemically resistant). The reference sources, with only a few exceptions, do not indicate the type of clothing material, such as PVC, Viton, or Butyl rubber, that is compatible with the product or substance. Using a clothing material that isn’t compatible can be disastrous as the product could permeate and even destroy the protective garment. David M. Lesak, in an article in *Fire Engineering*, February 1985, points out that:

“It is important to realize that there is no one suit material that is compatible with all hazardous materials. In fact, there are some rather exotic chemicals that have no compatible material. Toluene, xylene, nitrogen tetroxide, and chlorine trifluoride are just a few such chemicals.”

Replacement costs for permanently contaminated or damaged fully-encapsulated protective garments can range from \$1800 to \$5000 or more per unit, not to mention the permanent damage done to the health and well-being of the emergency personnel. One solution to this problem is to use relatively inexpensive disposable suits and gloves, such as the PE coated Tyvek (DuPont) or Saranex (Dow), *over* the more expensive fully-encapsulated garments. This layering approach will help protect both the emergency responder and the expensive specialized garment. It is recommended that, whenever possible, emergency personnel should check the compatibility of garment materials with the involved substances before making entry into any hazardous environment.

## Structural Firefighting Clothing



This is the minimum basic protective clothing ensemble for any structure firefighting or rescue work. Known as “Full Protective Clothing” the ensemble consists of the following components: helmet with eye protection, flame resistant coat and trousers with vapor barrier, rubber boots with steel re-enforced toe and shank, gloves and positive pressure self-contained breathing apparatus. *This ensemble affords very limited protection from hazardous chemicals.*

## Specialized High Temperature Clothing

### Approach & Proximity Suits

These suits are commonly used by crash crews at airports. They are designed for short duration, close proximity to flame and radiant heat to temperatures up to 1500 degrees Fahrenheit, and will withstand exposure to steam and weak corrosive substances. *Positive pressure breathing apparatus must be used with approach and proximity suits and they are NOT designed for fire entry!!*

### Fire Entry Suits

Fire Entry suits offer effective protection for short duration entry into total flame environments such as found at petrochemical fires. They can withstand prolonged exposure to radiant heat levels as high as 2000 degrees Fahrenheit. Positive pressure breathing apparatus must also be used with these suits.



## Chemical Resistant Clothing

### Semi-encapsulated Clothing

Semi-encapsulated protective clothing is commonly used for short-term exposures to certain corrosives, poison liquids, PCBs, asbestos fibers, hazardous dusts, and many agricultural chemicals and pesticides. These suits are made from many different materials, such as Neoprene, Butyl rubber, Chlorinated Polyethylene, and the recently developed PE coated "Tyvek" (DuPont) and "Saranex" (Dow) products. Although these suits are much less cumbersome than the fully-encapsulating suits, they obviously don't afford the same level of protection against hazardous gases and vapors. However, because of their relatively inexpensive cost, these garments can be used once and disposed of. Semi-encapsulating suits can be worn with positive pressure self-contained breathing apparatus or with the air-purifying canister type respirators, depending on the type, toxicity and measured concentration of the chemical substance to be encountered.





Level A

### **Fully Encapsulated Specialized Clothing**

Fully encapsulated suits are worn when there is a high potential for contact with hazardous vapors and gases, or when the measured concentration of the substances are above the IDLH Level. These suits are classified into the following three types:

- TYPE I      Positive pressure self-contained breathing apparatus worn underneath the suits.
- TYPE II     Positive pressure self-contained breathing apparatus worn outside the suit.
- TYPE III    Airline-supplied respirator device (umbilical cord type) with a positive pressure emergency air supply escape device.

### **EPA Levels of Protection**

Personnel must wear specialized protective clothing and equipment when operations involve working in known or suspected contaminated environments, or when direct contact with skin-affecting substances is possible. Full face-piece respirators and self-contained breathing apparatus should be used to protect the lungs, eyes and gastrointestinal tract against airborne toxicants and chemical resistant clothing should be used to protect the skin surfaces from contact with tissue destructive and skin absorbable materials. Good personal hygiene used during and following an emergency incident also serves to limit or prevent the ingestion or absorption of toxic materials.

The EPA has divided protective clothing and equipment into the following four categories according to the degree of protection afforded:



Positive Pressure  
SCBA Outside Suit

- LEVEL A    Comprised of fully encapsulating chemical resistant clothing with positive pressure self-contained breathing apparatus (if an umbilical cord type of airline-supplied apparatus is used, an escape bottle must also be provided). Level A protection should be worn when the highest level of respiratory, skin and eye protection is needed.
- LEVEL B    Comprised of semi-encapsulating chemical resistant clothing with positive pressure self-contained breathing apparatus. Level B protection should be worn when the highest level of respiratory protection is needed,

but a lesser level of skin protection is required. Structural firefighting protective clothing does not qualify for Level B protection.

**LEVEL C** Comprised of semi-encapsulated chemical resistant clothing with air-purifying respirator, full-face type, equipped with canister (OSHA/NIOSH approved). Level C protection should only be worn when the criteria for using air-purifying respirators have been met.

**LEVEL D** Comprised of coveralls, gloves, steel toe and shank boots, hard hat and face shield or safety glasses. As Level D protection doesn't provide any real protection against chemical hazards, this level should be only be worn as a work uniform and not used on any incident site that presents respiratory or skin hazards to personnel.

## **Criteria for Selecting Levels**

To assist in determining which Level of protection should be required for an operation, the EPA has listed the following criteria:

**LEVEL A** To be used whenever the substances to be encountered require the highest level of protection, or when atmospheres contain concentrations at or above the Immediately Dangerous to Life and Health level. Level A protection should also be used when operations involve a high potential for contact with liquids, vapors or gases which are highly toxic.

**LEVEL B** To be used in atmospheres when the substances are in concentrations at or above the Immediately Dangerous to Life and Health level, but the substances do not represent a severe skin hazard. When the atmosphere contains less than 19.5% oxygen, Level B protection must be used as a minimum.

**LEVEL C** Level C protection can only be used when oxygen levels are at least 19.5%, and concentrations of the substances must be able to be reduced by the respirator to below the Threshold Limit Value (TLV). The Threshold Limit Value is the limit to which a person can be exposed to a substance for extended periods (eight hours or more) without causing any adverse health

effects. When using Level C protection, the atmospheric concentrations of the contaminant must not exceed the IDLH level.

**LEVEL D** Level D protection is only to be used only when no contaminants are present, or when operations preclude splashes, immersion, or potential for inhalation of the substances.

## **Containment Operations**

Containment can be considered as any action used to stop, slow or redirect the spread of a hazardous substance. There are many techniques that can be employed for containing a hazardous materials release including: diking, damming, absorbing, covering, contain-erizing, plugging and patching, and diverting materials into a hold-ing area for later pick-up and disposal. However, it must be under-stood that any containment operations should be performed by personnel having the proper training for the task and the access to the appropriate protective clothing. The following section presents an overview of these methods:

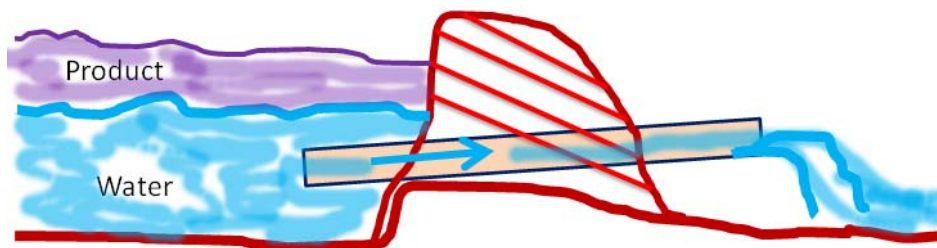
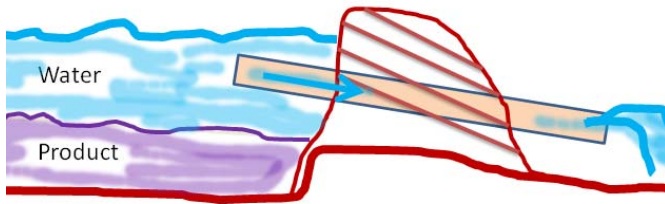
### **Dikes**

Dikes are barriers constructed to stop or redirect the movement of spilled materials. Dikes can be made by using plastic bags filled with dirt or sand, or by using many of the commercial products especially manufactured for containing hazardous materials. The key to safety when involved with diking and damming operations is to ensure that the material used for containment is chemically and physically compatible with the spilled substance.

### **Dams**

Dams are barriers used to hold back hazardous substances that have been released into rivers, ditches, streams or drainage swales. Dams can be made from dirt, or with plastic bags filled with dirt or sand, and they can be either simple or complex in construction. Simple dams are generally designed to hold back all of the flowing materials. Complex dams are usually constructed in such a manner as to separate the materials from each other. For instance, water can be separated from non-water soluble hydrocarbons using either an overflow type or an underflow type dam.





### Absorption

Generally, the materials that are used for absorption are usually those materials that are capable of absorbing several times their own weight in hazardous substances. Raw materials such as sand, dirt, sawdust, vermiculite and diatomaceous earth are very often used for this purpose. Moreover, there are many products (imbibing materials) on the commercial market that have been specially manufactured so as to soak-up hazardous substances while not absorbing water. Again, the key to safe operations is to ensure that the absorbent material is compatible with the spilled substance.

### Covering

Exposures, such as manways, storm drains and sewer inlets, can be protected from hazardous materials spills by covering the exposure with plastic sheets or salvage covers. Hazardous solids, powders and dusts can also be covered with plastic sheeting to prevent the materials from becoming airborne. Moreover, spills of flammable liquids can also be covered with firefighting foam to prevent vapors from being released and subsequently finding an ignition source.



### **Containerizing**

On many occasions, hazardous materials releases have been contained by simply placing damaged or leaking vessels into larger containers known in the industry as Salvage or Recovery Drums. The technique of placing a fifty-five gallon drum into an overpack container may, at first, appear to be simple task to perform. However, when the task has to be performed in Level A protection while working in a hostile environment, it could become a whole different story. Therefore, as with any manipulative skill, this technique should be practiced while using specialized protective equipment.

### **Plugging and Patching**

The objective of any plugging and patching operation is to control a leak at its source by stopping the flow of material from the container. Lead wool, duct tape, epoxy resins, pipe clamps, pipe plugs, rubber bungs, wooden plugs and toggle bolts are a few of the items that are generally used in plugging and patching techniques. As with the commercially made materials that are available for diking and absorption, there are many gadgets and products available for plugging and patching. Again, to ensure safety, any product that is used to plug or patch a leak must be checked for compatibility with the substance(s) to be contained.

### **Isolation & Diversion**

If spilled substances cannot be diked or prevented from entering storm drain or sewer systems, they can be diverted into a holding area for later removal and disposal by vacuum trucks. In order to utilize this tactic, the section of storm drain or sewer system to be isolated must be plugged in both the downstream and upstream directions. This means that the engineering maps of these systems will have to be obtained.

## **Group Exercise Session #4**

The following group exercise is intended to reinforce the main points presented in the text and to provide the student with the opportunity to demonstrate competency in developing a contingency plan for site-control, site-entry and mitigation operations. This exercise is to be completed in a study-group format using the directions on the next page. At the conclusion of the session, a five (5) minute presentation containing an overview of each group's findings will be delivered by a representative from each of the groups.

## **Emergency Incident Contingency Plan**

For the purposes of this exercise you are asked to role-play as Battalion Chief #1. You have arrived on-scene at the incident at Julio and the railroad tracks and have assumed command from Engine #1. You now have in your possession the Train List which has been reproduced on the following page.

Using the information presented, the map of Santa Luisa, and the reference sources specified on the following page, develop an incident action plan for the site control measures, site entry procedures and mitigation operations that will be required to resolve the simulated incident occurring in Santa Luisa. Make sure that the plan includes the following four considerations:

1. Determine the actual isolation and zoning perimeters. Specify who will be expected to carry-out these functions. Include a sketch showing work zones to be established.
2. Determine the actual evacuation perimeters. Specify who will be expected to carry-out this function.
3. Determine the mitigation operations that will be necessary in order to resolve this simulated incident.
4. Make a draft of the Incident's Site Safety Plan under which the mitigation operations can be conducted safely. Include the following:
  - √ Criteria for Selecting Levels Evaluate the risks associated with the operations to be conducted.
  - √ Identify staffing requirements for the various work teams and key safety personnel.
  - √ Designate the boundaries of the various work zones.
  - √ Determine the necessary emergency procedures (escape routes, etc.).
  - √ Determine decontamination needs.
  - √ Determine the required level of protective clothing for each of the work zones.
  - √ If possible, determine the actual type of protective clothing to be used in the exclusionary zone.
  - √ Determine medical monitoring and treatment needs.

## TRAIN LIST

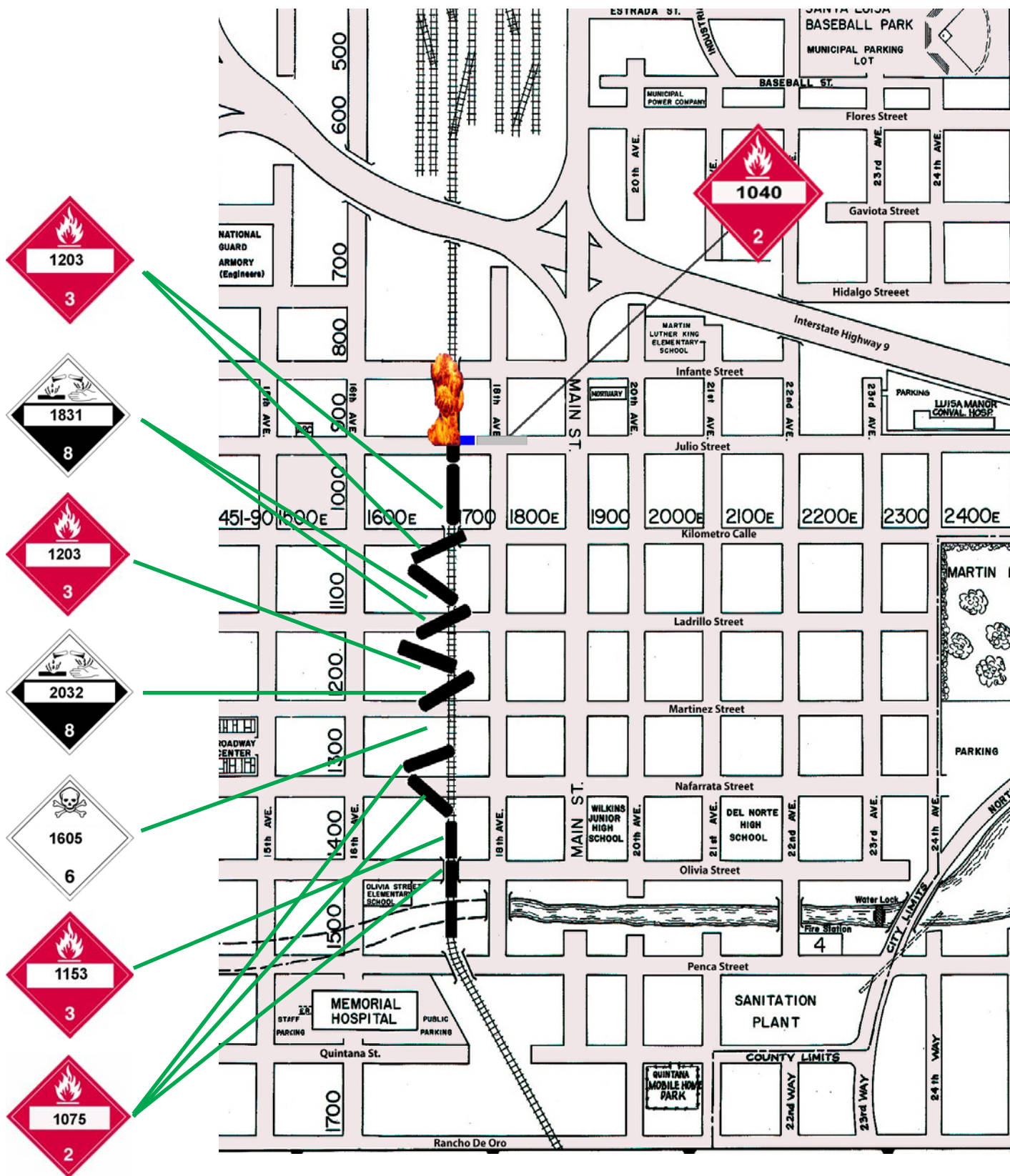
| Train Order       | Placards | Standard Transportation<br>Commodity Code # |
|-------------------|----------|---------------------------------------------|
| Locomotive #12852 |          |                                             |
| Car #1 GATX 1326  | 1203     | STCC #4908178                               |
| Car #2 GATX 7641  | 1203     | STCC #4908178                               |
| Car #3 TSPX 4271  | 1831     | STCC #4930030                               |
| Car #4 TSPX 3421  | 1831     | STCC #4930030                               |
| Car #5 GATX 4031  | 1203     | STCC #4908178                               |
| Car #6 DOWL 4901  | 2032     | STCC #4918529                               |
| Car #7 FCCX 1371  | 1605     | STCC #4940335                               |
| Car #8 UTPX 6012  | 1075     | STCC #4905752                               |
| Car #9 UTPX 3271  | 1075     | STCC #4905752                               |
| Car #10 DOWL 3218 | 1153     | STCC #4913115                               |
| Car #11 UTPX 2147 | 1075     | STCC #4905752                               |
| Caboose #51390    |          |                                             |

### References Sources:

1. DOT Emergency Response Guidebook
2. U.S. Coast Guard Chris Manual
3. Emergency Handling of Hazardous materials in Surface Transportation
4. Cameo Response Information Data Sheets (appendices)

\* See map of Santa Luisa on the following page.

# HAZARDOUS MATERIALS ON-SCENE INCIDENT COMMANDER



## SITE CONTROL CONTINGENCY PLAN — SCENARIO #2

### SKETCH WORK ZONES:

**EVACUATION:**

[illegible]

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This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



## SITE CONTROL CONTINGENCY PLAN — SCENARIO #2

### SITE-SAFETY PLAN:

[illegible]

\_\_\_\_\_

[illegible]

*Subtitle C, Resources Conservation and Recovery Act (RCRA)*  
*Health & Safety Code*  
*Title 22, California Administrative Code*  
*California Vehicle Code*  
*NFPA Standard 472*  
*OSHA's Final Rule - 29 CFR Part 1910.120*

# Clean-up and Restoration

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On completion of this chapter the student will be able to:

1. *Describe* the techniques and equipment used in the clean up phase of a Level II or III hazardous materials incident.
2. *Cite* procedures necessary to access funding for clean up.
3. *Select* a clean-up contractor that is appropriate for a specific incident.
4. *Complete* a Uniform Hazardous Waste Manifest.
5. *Describe* disposal requirements and the concept of Residual Repositories.
6. *Describe* the process that terminates a Level II or III hazardous materials incident.

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Vapor reduction can be a critical factor while conducting clean-up operations involving volatile materials.

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## **Background**

Heavy equipment such as backhoes, front-end loaders and vacuum trucks are often used to clean up contaminated materials at the site of a release. In most cases, after the gross contamination has been removed by the heavy equipment, fine cleaning is continued with hand tools. Brooms made of absorbent materials may be the best way to pick up contaminated materials on hard surfaces. Clay, flyash, baghouse dust, lime, sand and dirt can be used to absorb contaminants. Additionally, neutralization, phase separation and gelling can be used to produce an end product which can be disposed of or recycled. Some hazardous materials require additional treatment that may not be economically feasible to accomplish at the incident site, as relatively small amounts are involved. Carbon absorption, chlorination and other special processing are best done at a treatment or disposal facility. Containers, such as recovery drums, dump trailers, lugger or roll off boxes, vacuum trucks and tanker trucks, can be used for removal of the product to a licensed disposal facility. All treatment, transportation, storage, and disposal of hazardous wastes must conform with the regulations issued under Subtitle C of the Resources Conservation and Recovery Act (RCRA), Title 22 of the California Administrative Code, Health & Safety Code, and the California Vehicle Code.

Hazardous materials that find their way into water can cause great damage to all life and to the environment. Special techniques have been developed to treat incidents in water. Chemicals lighter than water float on the surface and can be treated or removed with oil booms and skimmers or absorbents, which can be loose or in sheets or pads. In some cases, it's best to use surface tension modifiers that break up the floating layer, causing droplets of material to sink. Chemicals made to sink, or chemicals heavier than water, are easier to collect by using bypasses, pumps, or by diverting the flow. When this is not feasible, dredging can be used with conventional equipment. The dredged product is pumped to a spoil area and can be removed later or, if environmentally sound, covered in place. Dredging can be the easiest and cheapest method for removing hazardous materials in water. For chemicals that dissolve in water, specialized pieces of equipment must be used and mobilized at the site. This usually precludes their use on very low-volume incidents. For large spills it is usually cheaper to treat materials at the site rather, than haul them to a treatment facility. The processes used are neutralization, precipitation and carbon absorption.

Vapor reduction can be a critical factor while conducting clean-up operations involving volatile materials. Firefighting foaming agents have been successfully used to reduce vapor hazards and for extinguishment of flammable liquid fires. However, it is important to use the correct foaming agent for the particular product being handled. Foams that are designed to work on regular hydrocarbons, such as gasoline, are not effective on polar solvent products, such as ethyl alcohol and methyl ethyl ketone. Special alcohol type concentrates are manufactured expressly for use with these water soluble products, and some concentrates are now being produced as combination type agents which can be used for either polar and non-polar products. While using combination type foams, the percentage of concentrate that is needed to achieve vapor or fire suppression becomes the variable factor. For instance, the standard for many of these products recommends that 3% of the combination type concentrate to be used to combat regular hydrocarbon fires, while a richer mixture of 6% is recommended for polar solvents. Certain manufacturers have now taken the state of the art to a point where specialized Haz/Mat Foams have been produced which can form a polymerized plastic sheet over spilled flammable liquids, keeping vapor production to the minimum. The problem with this type of product is that the plastic material is flammable and obviously should not be used in a fire situation.

Appropriate remedial actions, including clean-up of hazardous substances, site restoration and the transportation and disposal of hazardous wastes, can be extremely costly and require specialized expertise and equipment. Due to the high costs involved it is of paramount importance to know how to access the required funding, how to select the appropriate clean-up contractor and to understand the legal responsibilities for the disposal of hazardous wastes. The city, county, or special services district in which the incident occurred may end up absorbing the total costs of the incident, if proper channels are not followed in obtaining funding, or if the documentation process is not correctly adhered to.

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Chemical clean-up for Level II & III incidents can be very expensive and every effort should be made to avoid encumbering your department with clean-up costs.

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## Financing Clean-up

The primary responsibility for the clean up of any chemical spill is with the manufacturer of the chemical, the shipper, or the owner. Do **not** call a private contractor to clean up a spill unless authorized to do so by one of the above, or unless directed to by a state or federal agency. Chemical clean-up for Level II & III incidents can be very expensive, and every effort should be made to avoid encumbering your department with clean-up costs. The fire department should only *initiate* clean-up at a last resort. If there is no one else to assume the responsibility, remember that **“You Call, You Pay,”** unless prior permission is granted from an agency such as the State Department of Health Services. However, small Level I incidents often can be cleaned up and restored to normal services by the local responding agencies—usually the Fire Department in conjunction with Public Works and law enforcement. In cases where there isn’t a responsible party available to pay for clean-up, the local city/county agencies must use the small funds they have available for clean-up and restoration of services.

On larger incidents where the responsible party cannot be found, refuses, or is unable to assume clean up responsibilities in a timely manner, the responding fire department can request funding for clean-up from the Emergency Reserve Account (ERA). Administered by DTSC the ERA is contacted by calling the DTSC hotline (1-800-852-7550). The ERA was created by Section 24345 of the Health and Safety Code which set up an annual \$1,000,000 account to abate potential emergencies that could result in fire, explosion, or human health hazard from exposure to hazardous materials. The DTSC will want all the information you have on the responsible party so that they can sue for restitution. Do not call a clean-up contractor before you receive the go-ahead from DTSC unless your department is willing to assume the cost. State funds cannot be expended without *prior notification*.

### ACCESSING THE STATE SUPERFUND

To access the ERA three criteria must be met:

1. The substance must be **defined as hazardous** or an extremely hazardous waste per Title 22 CCR.

2. The substance must present an **imminent substantial danger** to the public health or the environment.
3. Either **insufficient or no funds** are available from other sources (i.e., the shipper, owner, or manufacturer).

The Incident Commander should call the State Office of Emergency Services' 24-hour hotline {1 (916) 845-8510}, and request that the Department of Health Services be contacted to authorize clean-up. A representative of DHS will return the call to the Incident Commander.

A written request for state funding, including a report of the incident, must be sent to the address below.

**Emergency Response Coordinator**  
 Department of Health Services  
 Program Management Section  
 Toxic Substances Control Division  
 744 P Street  
 Sacramento, CA 95814  
 (916) 324-2445 (No. not verified)

The incident report must specify the following:

- Name, title and agency of reporting party
- Name, title and agency of official confirming the spill and requesting funding
- Date and time of the incident
- Location of the incident
- Substance(s) spilled
- Quantity of substance(s) spilled
- Characteristics of substance(s) spilled
- Weather conditions
- Name and address of the responsible party (if known)
- Assessment of risk to public health or environment
- Estimated cost of clean-up
- Certification of toxic, fire, explosion hazard, or threat to public health by local officials

The EPA administers the Federal Superfund through SARA (Superfund Amendments and Reauthorization Act). In California,

the State Department of Health Services (DHS) and the EPA will determine their individual financial responsibility on large scale incidents where both the State Superfund and the Federal Superfund are involved. Funding may also be obtained in California from Cal-Trans, if the spill is located on a State Highway. In these cases, Cal-Trans usually sends their own clean-up contractor selected from a pre-qualified list.

The Bureau of Narcotic Enforcement and the Department of Justice has funding to clean up clandestine drug labs, or they will *reimburse* local agencies that have expended funds to perform this task. They will also coordinate the evidence collection, investigation and prosecution for these particular incidents.

Other state and federal agencies, such as Department of Fish and Game, the Regional Water Quality Control Board and the United States Coast Guard have financial responsibilities for clean-up. The Incident Commander need not contact these agencies to obtain funding. This will be coordinated with the activation of State's Scene Management System and the Incident Commander's request for funding to the State Department of Health Services.

When clean-up funding is requested, the State Department of Health's usual mode of operation is to dispatch a contractor selected from a pre-qualified list to perform clean-up functions. However, if the cost factor is estimated to be less than \$5,000 the DHS usually gives the go-ahead for Incident Command to obtain a clean-up contractor of the Command's own choosing, with the agreement that the State will reimburse the contractor directly from the Superfund at a later date. Therefore, an Incident Command may end up being directly responsible for making the final selection. The following section has been included in this manual to provide some background and criteria on how to select a clean-up contractor.

## **Selecting a Clean-up Contractor**

An ideal situation would be to contact one contractor that has all the expertise and equipment needed to handle any emergency that may arise. Although there are some firms that come close to meeting this request, most likely you will call in two or more contractors to meet your needs at an incident. Incident Command should keep a pre-qualified list of clean-up contractors in their Haz/Mat Contingency Plan.



When selecting a clean-up contractor, *thoroughly check the company's background*. Have the company submit a list of customers that have used their services. Call their references to get an understanding of the firm's reliability and level of expertise—can they be trusted with a simple, moderate or complex incident? Is their equipment available 24 hours a day? Are they state licensed? Do they have, or can they acquire, adequate insurance coverage or a bond, for their own personnel and other potential liabilities? Do they have properly trained personnel with appropriate equipment? Are their fire marshal permits current? The following are guidelines of things to look for in a good clean-up contractor.

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Above all, a good clean-up contractor will have *trained* response personnel.

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### **Trained Personnel**

Above all, a good clean-up contractor will have trained response personnel. A good contractor will keep adequate training records. Find out if these records are available for your inspection and if not, why not? Find out if their supervisory people are properly trained in the handling of hazardous materials spills, and if their labor force is also given haz/mat training. Do they have a trained response team for complex incidents? Ask if they have chemists on staff or on call. Have them submit a list of management personnel that can be contacted after normal business hours in an emergency.

Vacuum truck operators must have the expertise to vent a truck without causing a cave-in. They must also have a working knowledge of chemistry. For example, sodium chlorate can become a strong oxidizer upon contact with organics. If your contractor is an untrained septic tank operator, loading sodium chlorate into his or her tank without thoroughly cleaning it would cause the truck to explode. Moreover, if the tank operator were to use an oil lubricated gear pump, the pump would be shrapnel within moments.

### **Communications**

Is there radio communication among the response team members, dispatch, and supervisory personnel? Is their communications facility sufficiently manned? Are there 24-hour pager communications to reach key personnel after normal business hours?

### Supportive Equipment

A good clean-up contractor will have appropriate supportive equipment to supply their response personnel at the scene of a small, moderate and/or large incident. Such equipment can include, but is not limited to:

- Appropriate personal protective clothing which may include total environmental suits, disposable coveralls, PVC, Neoprene, Gra-lite 20.
- Air packs, the ability to recharge air bottles, hose line breathing masks.
- Spark resistant hand tools and portable lighting
- Construction equipment, i.e. backhoes, front-end loaders, shovels, pumps, hoses, heavy duty cleaning equipment, containment equipment.
- Dedicated hazardous spill response equipment.
- Laboratory capability for categorization of unidentified substances, or titration of corrosives diluted by wash downs.
- Information sources, i.e., miniature reference library and on-call staff chemists

### Vacuum Trucks

What sizes of trucks do they have, how many, what types, i.e. mild steel, stainless steel, coated, rubber-lined, glass lined, etc. Are both wet and dry type vacuum trucks available? Are the tanks ASME (American Society of Mechanical Engineers) Coded? Check for types of hose ends, valves, or miscellaneous fitting used—some oil haulers, drilling field operators and septic tank operators use aluminum fittings that are not compatible with corrosives. Diesel trucks and compressors are preferable to gas trucks, especially where volatile chemicals are involved. Insure that all trucks carry and use ground cables.

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...never allow a dry vacuum truck operator to drive and vacuum at the same time! Many dry vacuum trucks have **exploded** due to static electricity generated by their movement...

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Spills, like vacuum trucks come in all sizes. You won't need a 6000 gallon tanker to pick up a 500 gallon spill (or vice versa). Normally you will want a contractor who has a 1200 or 1500 gallon tanker. You will also want to know the name of a contractor who has a 6000 gallon tanker for a large spill, or wash down that has generated a large quantity of contaminated water. There are two types of vacuum trucks—**liquid** vacuum trucks, and **dry** vacuum trucks. Liquid vacuum trucks are the type owned by septic tank operators. However, most septic tank operators know very little about hazardous chemicals, and don't have the appropriate protective clothing to do the job. Dry vacuum trucks can run down the road while vacuum-

ing, like street sweepers. You should *never allow a dry vacuum truck operator to drive and vacuum at the same time!* Many dry vacuum trucks have exploded due to the static electricity generated by their movement, often killing and injuring responders in the process. A dry vacuum truck should drive to the material, stop and be **grounded**, before it starts its pumps in operation. Dry vacuum trucks are equipped with filter bags with a fine mesh that will not allow the product to escape into the atmosphere during vacuum operation.

There are some acids, such as nitric acid, that cannot be put into mild steel trucks, and there are also some acids that cannot be put into stainless steel trucks. There are even some commodities you cannot put into rubber lined, mild steel, stainless steel, or even titanium trucks. You may need to access specialized trucks with lead, glass or nickel cad lining. Hydrofluoric acid is one such product that requires specialized containerizing. There is probably no company available that has all of these trucks. Some are in dedicated service and are used by a manufacturer of a particular product. If there is a chemical company in your area that uses a special truck, you need to enter it in your contingency plan.

A vacuum truck is only capable of creating approximately 27 feet of vacuum. This won't do, when you have a spill down a 200 foot ravine. To solve this problem, the truck must be supplemented with pumps. A double diaphragm pump has a lot of suction power, but for a 200 foot ravine you may need a large air compressor and several double diaphragm pumps to use in a series. A good clean-up contractor is going to have the right equipment.

### Specialized Equipment

If you have a spill that is more complex than can be cleaned up with backhoes or vacuum trucks, *you will need to be especially sure that your contractor has a trained response force.* The contractor will also need additional specialized equipment. This is where communications is vitally important—can they radio through their dispatch to order the necessary equipment and response team? How fast can the specialized equipment and personnel arrive? Do they have access to a 10,000 PSI **hydroblast** machine? This powerful machine, when used in conjunction with a “shotgun tip,” has the ability to peel sulfur off a roadway after a molten sulfur spill *without damaging the pavement!* Do they have **pressure washers**—machines capable of generating 1200 pounds PSI of heated water? This machine has a self-contained propane tank that heats water to approximately



150°. Do they have a **chemical wash truck**—a truck with three tanks that are valved together for mixing? This truck can be used to wash a chemical with a water supply and then a rinse chemical, or simply be used like a tanker truck as a water source. Do they have a **gear truck**—for picking up bulky items that cannot be picked up with a dry or wet vacuum truck?

Does the contractor own or have access to a reliable **heavy duty tow truck** service that is familiar with and will comply with the contractor's safety standards? An untrained heavy tow truck operator can cause more havoc with a hazardous materials spill than was created in the original spill.

### Spills in waterways

You will also need to find a clean-up contractor with the capability of cleaning up spills in the water. They must have booms, boats and trained, qualified people to operate them! Confer with the state Department of Health Services, or the Department of Fish and Game about such a contractor. Are they reliable? Do they have the necessary expertise and the right equipment to do the job? These agencies may provide you with a list of this type of contractor in your area.

### Removing the waste

Once all the material is picked up, it must be removed to an appropriate disposal site. Your clean-up contractor should have a working relationship with the State Approved Class I disposal sites in your area. The contractor must be a state licensed waste hauler that can safely and legally store hazardous waste until a suitable waste facility is found and opened. The disposal facility should be called before moving waste to the site to ensure that the facility can handle the material. Often this is overlooked and causes difficulties for everyone. Your contingency plan should have provisions for involving the disposal facility *prior* to moving the waste to the site. Call them ahead of time and tell them what you've got. Let them run through CHEMTREC and find out what it is and how best to handle it, or find out *if* they can handle it! In some situations, no disposal site can handle the waste—it must be sent back to the manufacturer, where they will handle it with specialized equipment. In most such cases, they reprocess it.

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Your clean-up contractor should have a working relationship with State Approved Class I disposal sites in your area.

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## SUMMARY

Keep an updated, pre-qualified list of contractors available in your contingency plan that can handle a variety of calls and complexities. Check the background of your potential clean-up contractor.

Remember, a good clean-up contractor:

- Must have personnel trained in hazardous materials emergencies and clean-up mitigation
- Must have the appropriate equipment/expertise needed to handle the specific type of call
- Must have 24-hour service with good communications support
- Must be able to safely and legally store waste until it can be relocated at a disposal site
- Must have a working relationship with disposal site facility.

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Keep an updated, pre-qualified list of contractors available in your contingency plan that can handle a variety of calls and complexities. Check the background of your potential clean-up contractor.

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## Disposal Requirements

The requirements for the disposal of a hazardous material recovered from an emergency scene are regulated no differently than disposal requirements for industrial waste generators. Disposal of hazardous materials is regulated under Title 22 of the California Administrative Code. It is the responsibility of the Incident Commander to ensure that the disposal of hazardous waste from an incident in accordance with State laws. The hazardous waste must be collected or excavated, and all contaminated debris—now also considered hazardous waste—must be transported by a licensed hauler to a permitted waste disposal facility or licensed recycling operator. Incident Command must monitor clean up procedures initiated by the responsible party. If a responsible party cannot be determined or located, or if the responsible party refuses or is unable to take on the responsibility of shipping the waste to the disposal facility, the local responding agency must undertake that responsibility. A **Uniform Hazardous Waste Manifest** must be completed and forwarded appropriately whenever hazardous materials are transported, even from the emergency site (Health and Safety Code Section 25160). Copies of the Uniform Hazardous Waste Manifest *must* be maintained as part of the documentation process for *all* hazardous materials incidents involving clean-up with disposal, whether initiated by the responsible party or the



with disposal, whether initiated by the responsible party or the responding agency.

## Uniform Hazardous Waste Manifest

The instructions for filling out the manifest are found on the back of the actual manifest and are reproduced in full at the end of this section of the manual for the group exercise. The form is complex enough to warrant some discussion.

The *Generator's EPA ID* number requested in item #1 needs some explanation. There are five different letter series designations that can be entered in this box, depending on who the generator is and what type of waste is being transported (CAL, CAD, CAC, CAS, and CAH). If the shipper is the responsible party, the shipper's assigned industry generator number will be used in this box. This number will begin with either CAL for state regulated waste, or CAD for federal and state regulated waste. If the responsible party does not have an assigned generator number, the EPA will assign him or her a one-time-only temporary waste permit number that starts with CAC. (Call the Department of Health Services, Toxic Substances Control Division, 916-323-3254 for an assigned number.) If the *local responding agency* has the responsibility of shipping the waste, the agency should use their county's assigned generator number that starts with CAS. This number designates that the waste is being shipped by the local responding agency (fire department) on a one-time-only basis, when the responsible party is not available. There is also a CAH county number for counties that conduct residential hazardous waste collection programs and ship the resultant waste.

**Local area CAS numbers accross the state are identical, except for the last three digits. The last three digits represent the county number.**

**For example:** Santa Clara County CAS 111 111 043

Items #5-8 request the company name of the *waste hauler* and the company's EPA ID number (see above for I.D. number description). Occasionally, more than one waste hauler will be used.

Items #11-14 ask that you enter the U.S. DOT proper shipping hazard class and U.N. ID number for each waste as identified in 49 CFR 171 through 177. If unknown, write unknown. Enter the number of containers, type of container, total quantity and weight

or volume of each waste. Printed in the instructions on the back of the form is a list of the accepted abbreviations for container types and units of measurement.

### State Board of Equalization Disposal Taxes

Item B, at the top right of the form, asks for the *State* Generator's ID number. This number is to record **disposal taxes** due under Section 25174 of the Health and Safety Code paid to the Board of Equalization. The shipper's Hazardous Waste Tax Account number issued by the Board, should be written in this section. This number begins with either HA or HY. No other number is valid here. If the shipper does not have an account number, contact the Board at (916) 739-2582, Mon-Fri between 8 am - 4 pm, to receive one. Although emergency response agencies are **exempt** from paying the disposal tax if they are transporting hazardous waste materials generated by a delinquent responsible party, the response agency will still need to enter a State Generator's ID number. Failure to do so would result in being charged the tax at the disposal facility, as facility operators are required to collect the tax if there is no State Generator ID number entered in box B. A response agency should call the Board to have a State Generator ID number assigned to them, and enter that number in their contingency plan, as having an account number *pre-assigned* would allow for clean-up of emergencies that occur after business hours. If the Board mistakenly charges the response agency with the tax, simply write the Board explaining that the waste was being shipped by the agency, as the responsible party was unknown or unable to ship the waste.

Item C & E requests the Transporter's *State* ID. This is the certification of compliance number of the vehicle used to transport the hazardous waste.

Item I requests a waste category number for the state and the EPA. For state wastes, locate Table 3 in the instructions with the form. Select the appropriate number after reviewing the entire list. For RCRA wastes, enter the EPA's hazardous waste code from 40 CFR 261.30-33. To obtain federal assistance call 1-800-424-9346 during business hours, eastern time.

Item K asks you to fill out a waste handling code selected from Table 4 of the form's instructions.

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Although emergency response agencies are **exempt** from paying the disposal tax if they are transporting hazardous waste materials generated by a delinquent responsible party, the response agency will still need to enter a State Generator's ID number.

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## Disposal Facilities

For many years, Class I disposal facilities were used for dumping untreated hazardous and extremely hazardous wastes, and Class II disposal facilities were used for non-hazardous wastes that may cause significant contamination of water resources. However in California, this situation has now been drastically changed due to the passage of the AB 2948, the “Tanner Bill.” This law came into effect January 1, 1990, and expressly prohibits the land disposal of all *untreated* hazardous wastes, and also turned disposal sites into **Residual Repositories**. One may say that a dump by any other name would smell just as sweet, however, it is important to realize that this statute *does* indeed change the whole concept of hazardous materials dumping. Under the Tanner Bill, after the generator of a hazardous waste has *treated* the waste material and arranged for transportation to a disposal site, the material is then held in storage for that generator at the repository. The generator **never** actually loses ownership of the waste material, and can be requested to move it to another repository at a later date. This aspect can have very serious consequences for an emergency response agency. For instance, if an Incident Commander took on the sole responsibility to neutralize, or otherwise treat a spilled hazardous substance without permission from a responsible party or a higher authority such as the DHS, the Incident Commander’s agency may now be construed as the new owner of the substance as the constituents of the compound have been significantly changed (a new compound created). This could mean that the emergency response agency may be held *totally* responsible for that substance forever!

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The Tanner Bill created **Residual Repositories**: ‘The generator **never** actually loses ownership of the waste material, and can be requested to move it to another repository at a later date.’

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The Toxic Substances Control Division of the Department of Health Services classifies wastes and can designate the disposal site on a case-by-case basis. The Toxic Substances Control Division can be contacted for a complete and updated *list of residual repositories* at the following address. They can also provide a *list of licensed waste haulers*.



**California Department of Public Health**

Toxic Substances Control Division  
Permit Program Development Unit  
Sacramento CA  
[www.dhes.ca.gov](http://www.dhes.ca.gov)

Computer information line  
(916) 558-1784

Record Safety Information referral line  
(800) 550-5234

Recorded Information from the CDC  
(800) CDC-INFO

### **Local Haz/Mat Clean-up Contractors**

Make your own list of your Local Hazmat clean-up contractor numbers and check it periodically. The contractors and contractor numbers change frequently.

Below is a sample list of past contractor names. This list is not intended to be presently accurate; it is intended to be used as a memory jogger.

Two good places to research for your local contractors are your local yellow pages and on-line (there is always Google). Another source is your local Department of Public Health or state approved list.

#### ***SAMPLE LIST***

Tri-State Transportation  
Crosby-Overton  
Allied Oil  
South Bay Chemical Co.  
I.T. Corporation  
Solvent Service, Co.  
Oil Clean-up firms  
Hazardous Waste Clean-up firms  
Hazardous Medical Waste Collection firms  
Agriculture Hazardous Waste Clean-up firms

\_\_\_\_\_

## **YOUR LIST**

Company Name, Address, Phone Number, Website,  
Name of Contact person, if available.

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper appears to be a standard notebook page or a sheet of stationery.

## Pesticide Spill Clean-up Teams

**PSTN:** Pesticide Safety Team Network of the National Agricultural Chemicals Association (NACA). Information service and on-site assistance with decontamination kits.

CHEMTREC: (800) 424-9300

### Disposal Information

#### LOCAL DEPARTMENT OF HEALTH SERVICES

Contact Person:

Number:

Website:

#### LOCAL DEPARTMENT OF ENVIRONMENTAL HEALTH

Contact Person: \_\_\_\_\_

Number: \_\_\_\_\_

Website: \_\_\_\_\_

### Class I Residual Repositories (Disposal Sites)

**CHEMICAL WASTE MANAGEMENT**, Hollister, San Benito County 1 (831) 636-5151

**CHEMICAL WASTE MANAGEMENT, INC.**, Kings Co. Kettleman Hills (209) 386-9711

#### ADDITIONAL DISPOSAL SITES:

Name, Address, Phone Number, Website

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## Restoration of Normal Services

After clean-up and removal of hazardous wastes to a disposal facility, an inspection must be made of the incident scene by a representative of the County Health Officer. When an area has been contaminated by a release of hazardous materials, *the authority to declare an area clean and safe for public reentry rests solely with the County Health Department*. This function is **not** within the scope of the Incident Commander. However, commanders should make sure that this function is performed and documented appropriately. If the incident involves a building, the local building inspector may also want to inspect the building for *structural stability*—after it has been released by the Health Officer—before allowing people back into the building. Furthermore, the Department of Fish and Game may want to inspect a waterway for *environmental stability* after the Health Officer declares the waterway safe for humans, CalTrans may want to inspect a previously contaminated highway for *soundness* before the Highway is re-opened for service.

## Terminating the Incident

Minor clean-up and site restoration of Level I incidents are frequently completed before the first responders are released from the scene. For Level II & III incidents, however, the clean-up phase can take days, weeks or months. In such cases, the procedures for terminating an incident should be well under way before clean-up and restoration of the scene is accomplished.

Once the final clearance has been obtained from the responsible health agency, it is important that every haz/mat incident be formally terminated by a specific, written procedure. This documentation process should include what safety procedures were taken, a description of site operation, what hazards were faced and what lessons were learned from the incident. It also provides a record of the information and data which may be required to be documented in order to comply with local, state and federal laws. Moreover, termination procedures will help prepare for any litigation procedures that may arise from the incident. Termination activities should be divided into three phases:

- ✓ **DEBRIEFING THE INCIDENT**
- ✓ **POST-INCIDENT ANALYSIS OF THE INCIDENT**
- ✓ **CRITIQUING THE INCIDENT**

Failure to properly manage termination activities may have long-term consequences. After the “emergency phase” of the incident has ended, the Incident Commander should take the time to stop, take a deep breath and assess what has happened and what still needs to be done. If incorrect data or assumptions were used initially, this should be discovered during the termination phase, and corrections can then be initiated. Corrected information should be distributed and disseminated through the Debriefing, Post-Incident Analysis or Critique phase to ensure that mistakes are not repeated, and to ensure that the necessary modifications are made to the clean-up and disposal procedures.

## DEBRIEFING

Debriefing should occur at *demobilization* as soon as the “emergency” phase of the operation is completed, and if possible before the first responders have left the scene. Debriefing should include the initial responders, hazmat response team, decontamination team, EMS workers, Command Staff, General Staff, Division/Group supervisors, agency representatives and other key players as specified by the Incident Commander. An effective debriefing should be limited in time to 30 minutes and should:

- ✓ Inform responders what hazards they were (possibly) exposed to, and explain signs and symptoms.
- ✓ Identify equipment damage and unsafe conditions requiring immediate attention, or isolation for further evaluation
- ✓ Assign information-gathering responsibilities for a Post-Incident Analysis and critique
- ✓ Summarize the activities performed by Divisions/Groups
- ✓ Reinforce positive aspects of the response. (This is the appropriate time for, “Thanks for a difficult job, well done.”)

Debriefing should be conducted by one person acting as spokesperson. The Incident Commander may not be the best facilitator, or may not be available for the entire debriefing, but should be present to summarize the incident and reinforce positive aspects. The spokesperson should be someone in authority who can take a “big picture” view of the incident. The intent is to briefly review the incident, not analyze or critique every action of every player. If more interaction is needed on a specific subject or operation, this can be continued after the debriefing.

### **POST-INCIDENT ANALYSIS**

Post-Incident Analysis (PIA) activities should be assigned to a member of the Command Staff, such as the Information Officer, Safety Officer, Liaison Officer or Planning Section Chief. Termination activities should coincide with normal work assignments on the scene. PIA is the reconstruction of the incident to establish a clear picture of the events that took place during the incident and should be started as soon as possible after the “emergency” phase of the incident. The compilation of data and its analysis may take days or weeks (or longer on a major incident) to complete. A brief chronological review of who, what, when and where should be outlined. A simple timeline placing key players at specific locations at different times is useful. Financial responsibility should also be determined. The Command Staff Officer designated during the debriefing to collect information about the response will need to meet with the Incident Commander to review key events and identify subjects for follow-up. Information can be acquired from:

- ✓ Shipping papers or MSDSs
- ✓ Owner/Operator information
- ✓ Chemical hazard information sources, i.e., computer print-outs, reference books, etc.
- ✓ Cassette tapes from the Command Post and communications dispatch
- ✓ Notes by Division/Group supervisors, Section Chiefs, Command Staff
- ✓ Photographs, videotapes and sketches taken by the news media and department staff
- ✓ Exposure records and information from the Decontamination Team and EMS
- ✓ Incident Command flow charts (or Polaroid photos of these charts)
- ✓ Business cards or notes from agency, organization or company representatives
- ✓ Interview transcripts of witnesses conducted by investigators
- ✓ Interview transcripts of first responders
- ✓ ICS — 214 Unit/Activity Log

After the information has been gathered, a rough draft report analyzing the materials is developed. The Post-Incident Analysis should comprise of four key topics:

- ✓ **COMMAND AND CONTROL**
- ✓ **TACTICAL OPERATIONS**
- ✓ **RESOURCES**
- ✓ **SUPPORT SERVICES**

The rough draft report should be reviewed by key responders to verify the facts and time lines. The completed report should be forwarded to management for review and dispersal through the management system. Problems discovered during this process may pinpoint areas that need future modification or improvement, and should be thoroughly discussed in the critique session.

## Incident Critiques

Critiques for Level II and III hazardous materials incidents are recommended. The incident commander has the direct responsibility to schedule and organize the critique. Critiques should be held after the incident has been completely terminated and information has been gathered and analyzed. Effective critiquing sessions are a positive way to outline *lessons learned the hard way* and should be designed to improve first responder performance by increasing efficiency and pin-pointing weaknesses. A good critique promotes trust in the response system as being a self-correcting operational unit, and helps in preplanning for future significant incidents. It is also a time for sharing information between response agencies, and is also a very valid and important training tool. In fact, OSHA, under 29 CFR 1910, has even suggested that critiques of emergency response performance can adequately *serve as a means of satisfying the mandated refresher training requirements for employees*. OSHA's rationale being that employees who have actual knowledge of the acceptable and non-acceptable actions taken during the response, will be able to perform in a more appropriate manner during their next emergency response.

Due to the nature of a critique, it is important to understand that this is *not* the time or place to include the news media. A legitimate way to exclude the news media would be to schedule and organize the critique under the auspices of a "training session." Conducting a critique in this manner would better serve the real *purpose* of a critique which is to improve future performances.

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## HAZARDOUS MATERIALS ON-SCENE INCIDENT COMMANDER

Personnel should be free to discuss errors and identify areas which need improvement at a critique session. However, rather than placing blame on individuals, the focus of the critique should be placed on improving future performances. Discussing these areas with the public and the news media at this time could effect liability concerns in court later. *Remember that the incident you are critiquing today could end up in court at a later date.* Follow these simple precautions:

- ✓ Conduct the critique within the auspices of a training session
- ✓ Limit participation to individuals involved in the incident
- ✓ Absolutely no news media involvement
- ✓ No video tape or audio recording
- ✓ Have all parties involved agree that these discussions will remain confidential
- ✓ Limit conclusions to ways to improve for future response through training and education

It is important for the designated critique leader to be an effective *facilitator*. This may not always be the Incident Commander and may not even be a ranking officer. Local experts or informed third parties can fill this role. On a large incident with a myriad of agencies involved and grey areas of authority/responsibilities to consider, good facilitation skills of the critique leader can be crucial to the effectiveness of the critique session. The critique leader must have the ability to:

1. Control the critique, introduce the players and procedures, keep it moving.
2. Ensure that direct questions receive direct answers.
3. Ensure all participants play by the critique rules.
4. Ensure that each operational group presents their observations.
5. Summarize the lessons learned.

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OSHA suggests...critiques of emergency response performance can adequately serve as a means of satisfying the mandated refresher training requirements for employees.

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## Optional Exercise

### "Uniform Hazardous Waste Manifest"

The following exercise is intended for those students who may need to complete a Uniform Hazardous Waste Manifest. The form is a complex and important one. The following pages contain a blank Uniform Hazardous Waste Manifest followed by the instructions for filling out the form. (The instructions are found on the back of every Uniform Hazardous Waste Manifest, but are provided here for convenience. The instructions printed on the back of the form are barely readable as they are in very fine, small grey print—this may be your only opportunity to actually *read* them.)

Complete the Uniform Hazardous Waste Manifest based on the information in Scenario #1 found at the end of Hazard Assessment chapter.

Instructions for completing a  
Uniform Hazardous Waste Manifest  
DHS 8022 A (1-88) EPA 8700-22 (Rev. 9-86)

### INSTRUCTIONS FOR GENERATORS

- Item 1      Generator's US EPA ID Number—Manifest Document Number: Enter the generator's and in the space to the right of this line, enter a five-digit number of your choice.
- Item 2      Page 1 of \_\_\_\_\_ Enter the total number of pages used to complete this Manifest plus the number of Continuation Sheets, if any.
- Item 3      Generator's Name and Mailing Address: Enter the name and mailing address of the generator. The address should be the location that will manage the returned Manifest forms.
- Item 4      Generator's Phone Number: Enter a telephone number where an authorized agent of the generator may be reached in the event of an emergency.
- Item 5      Transporter 1 Company Name: Enter the company name of the first transporter who will transport the waste.
- Item 6      US EPA ID number: Enter the US EPA twelve digit identification number of the first transporter identified in item 5.
- Item 7      Transporter 2 Company Name. If applicable, enter the company name of the second transporter who will transport the waste. If more than two transporters are used to transport the waste, use a Continuation Sheet(s) and list the transporters in the order they will be transporting the waste.
- Item 8      US EPA ID number: If applicable, enter the US EPA twelve-digit identification number of the second transporter identified in item 7.
- Item 9      Designated Facility Name and Site Address: Enter the company name and site address of the facility designated to receive the waste listed on this Manifest. The address must be the site address which may differ from the company mailing address.

## HAZARDOUS MATERIALS ON-SCENE INCIDENT COMMANDER

- Item 10 US EPA ID Number: Enter the US EPA twelve-digit identification number of the designated facility identified in item 9.
- Item 11 US DOT Description: Enter the US DOT Proper Shipping Name, Hazard Class, and ID Number (UN/NA) for each waste as identified in 49 CFR 171 through 177.
- Item 12 Containers (No. and Type): Enter the number of containers for each waste and the appropriate abbreviation from Table I (below) for the type of container.

**Table 1 — Types of Containers**

|                                                 |                                                           |
|-------------------------------------------------|-----------------------------------------------------------|
| DM = Metal drums, barrels, kegs                 | DW = Wooden drums, barrels, kegs                          |
| DF = Fiberboard or plastic drums, barrels, kegs | CW = Wooden boxes, carton, cases                          |
| DF = Fiber or plastic boxes, cartons, cases     | BA = Burlap, cloth, paper or plastic bags                 |
| TP = Tanks, portable                            | TT = Cargo tanks (tank trucks)                            |
| TC = Tank cars                                  | DT = Dump truck                                           |
| CY = Cylinders                                  | CM = Metal boxes, cartons, cases<br>(including roll-offs) |

- Item 13 Total Quantity: Enter the total quantity of waste described on each line.
- Item 14 Unit (Wt./Vol.): Enter the appropriate abbreviation from Table II (below) for the Unit of measure.

**Table II — Units of Measure**

|                            |                            |
|----------------------------|----------------------------|
| G = Gallons (liquids only) | L = Liters (liquids only)  |
| P = Pounds                 | K = Kilograms              |
| T = Tons (2000 lbs.)       | M = Metric tons (1000 Kg.) |
| Y = Cubic yards            | N = Cubic meters           |

- Item 15 Special Handling Instructions and Additional Information:
- Generators may use this space to indicate special transportation, treatment, storage, or disposal information or Bill of Lading information. For international shipments, generators must enter in this space the point of departure (City and State) for those shipments destined for treatment, storage, or disposal outside the jurisdiction of the United States.

Item 16 Generator's Certification: The generator must read, sign (by hand), and date the certification statement. If a mode other than highway is used, the word "highway" should be lined out and the appropriate mode (rail, water, or air) inserted in the space below. If another mode in addition to the highway mode is used, enter the appropriate additional mode (e.g., and rail) in the space below.

### INSTRUCTIONS FOR TRANSPORTERS

Item 17 Transporter 1 Acknowledgement of Receipt of Materials: Enter the name of the person accepting the waste on behalf of the first transporter. That person must acknowledge acceptance of the waste described on the Manifest by signing and entering the date of receipt.

Item 18 Transporter 2 Acknowledgement of Receipt of Materials: Enter, if applicable, the name of the person accepting the waste on behalf of the second transporter. That person must acknowledge acceptance of the waste described on the Manifest by signing and entering the date of receipt.

Note International Shipments—Transporter Responsibilities: Exports—Transporters must sign and enter the date the waste left the United States in Item 15 of Form 8700-22. Imports—Shipments of hazardous waste regulated by RCRA and transported into the United States from another country must upon entry be accompanied by the US EPA Uniform Hazardous Waste Manifest. Transporters who transport hazardous waste into the United States from another country are responsible for completing the Manifest

(40 CFR 263.10(c) (1))

### INSTRUCTIONS FOR OWNERS OR OPERATORS OF TREATMENT, STORAGE, OR DISPOSAL FACILITIES

Item 19 Discrepancy Indication Space: Refer to California Title 22 Section 67162; 40 CFR 264.72 and 265.72 for help in completing this part. In this space you must note any significant discrepancy between the waste described on the manifest and the waste you actually received. If you cannot resolve significant discrepancy within 15 days of receiving the waste, you must submit a letter to your DHS Regional Administrator

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**HAZARDOUS MATERIALS ON-SCENE  
INCIDENT COMMANDER**

Administrator describing the discrepancy and your attempts to reconcile it. A copy of the manifest at issue must be enclosed with the letter.

- Item 20 Facility Owner or Operator: Certification of Receipt of Hazardous Materials Covered by this Manifest Except as Noted in Item 19. Print or type the name of the person accepting the waste on behalf of the owner or operator of the facility. That person must acknowledge acceptance of the waste described on the Manifest by signing and entering the date of receipt.

### **CALIFORNIA REQUIRED ITEMS**

Generators to Enter:

- B. If you will be paying the disposal taxes due under Section 25174 of the Health and Safety Code directly to the Board of Equalization (Board), enter your Hazardous Waste Tax Account number issued by the Board for paying the taxes due under this section. This account number is a 12-character number beginning with HA or HY. Other Board numbers you may hold are not valid for this purpose. Any person willfully falsifying or misusing their account number to evade or defeat the payment of the taxes is guilty of a felony. If you do not have an account number and are subject to these taxes, you should contact the Board at (916) 322-9070 Monday through Friday, between 8:00 am and 4:00 pm.
- C. Enter the certificate of compliance number of the vehicle used to transport the hazardous waste.
- E. If applicable, enter the certificate of compliance number of the second vehicle used to transport the hazardous waste.
- I. Enter waste category number. Select appropriate number from Table III. Review entire table before selecting a number. For RCRA waste(s), enter the EPA's table before selecting a number. For RCRA waste(s), enter the EPA's hazardous waste code from 40 CFR 261.30-33. To obtain federal assistance, call 800-424-9346 between 8:30 am and 4:30 pm eastern time.
- J. Enter chemical composition for each waste category. List components corresponding to the waste category entered.

**TSDF Operator to Enter:**

G. Enter EPA ID number.

K. Enter waste handling code(s). Select appropriate code(s) from Table IV.

**Table III**

**California Restricted Waste**

|     |                                                                     |
|-----|---------------------------------------------------------------------|
| 711 | Liquids with cyanides > 1000 Mg./L                                  |
| 721 | Liquids with arsenic > 500 Mg./L                                    |
| 722 | Liquids with cadmium > 100 Mg./L                                    |
| 723 | Liquids with chromium (VI) > 500 Mg./L                              |
| 724 | Liquids with lead > 500 Mg./L                                       |
| 725 | Liquids with mercury > 20 Mg./L                                     |
| 726 | Liquids with nickel > 134 Mg./L                                     |
| 727 | Liquids with selenium > 100 Mg./L                                   |
| 728 | Liquids with thallium > 130 Mg/L                                    |
| 731 | Liquids with polychlorinated byphenyls > 50 Mg/L                    |
| 741 | Liquids with halogenated organic compounds > 1000 Mg./L             |
| 751 | Solids or sludges with halogenated organic compounds > 1000 Mg./Kg. |
| 791 | Liquids with pH < 2.                                                |
| 792 | Liquids with pH < 2 with metals                                     |
| 801 | Waste potentially containing Dioxins                                |

**California Non Restricted Wastes  
Inorganics**

|     |                                                                                                                                                                                                      |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 121 | Alkaline solution ph > 12.5 with metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc) |
| 122 | Alkaline solution without metals pH > 12.5                                                                                                                                                           |
| 123 | Unspecified alkaline solution                                                                                                                                                                        |
| 131 | Aqueous solution (2 < pH < 12.5) containing reactive anions (azide, bromate, chlorate, cyanide, fluoride, hypochlorite, nitrite, perchlorate, and sulfide anions)                                    |
| 132 | Aqueous solution with metals (< restricted levels and see 121)                                                                                                                                       |
| 133 | Aqueous solution with total organic residues 10 percent or more                                                                                                                                      |
| 134 | Aqueous solution with total organic residues less than 10 percent                                                                                                                                    |

**HAZARDOUS MATERIALS ON-SCENE  
INCIDENT COMMANDER**

- 135 Unspecified aqueous solution
- 141 Off-specification, aged, or surplus inorganics
- 151 Asbestos-containing waste
- 161 FCC waste
- 162 Other spend catalyst
- 171 Metal sludge (see 121)
- 172 Metal dust (see 121) and machining waste
- 181 Other inorganic solid waste

**Organics**

- 211 Halogenated solvents (chloroform, methyl chloride perchloroethylene, etc.)
- 212 Oxygenated solvents (acetone, butanol, ethylacetate, etc.)
- 213 Hydrocarbon solvents (benzene, hexane, Stoddard, etc.)
- 214 Unspecified solvent mixture
- 221 Waste oil and mixed oil
- 223 Unspecified oil-containing waste
- 241 Tank bottom waste
- 251 Still bottoms with halogenated organics
- 252 Other still bottom waste
- 261 Polychlorinated biphenyls and material containing PCBs.
- 271 Organic monomer waste (includes unreacted resins)
- 272 Polymeric resin waste
- 281 Adhesives
- 291 Latex waste
- 311 Pharmaceutical waste
- 321 Sewage sludge
- 322 Biological waste other than sewage sludge
- 331 Off-specification, aged, or surplus organics
- 341 Organic liquids (nonsolvents) with halogens
- 342 Organic liquids with metals (see 121)
- 343 Unspecified organic liquid mixture
- 351 Organic solids with halogens
- 352 Other organic solids

**Sludges**

- 411 Alum and gypsum sludge
- 421 Lime sludge
- 431 Phosphate sludge
- 441 Sulfur sludge
- 451 Degreasing sludge
- 461 Pain sludge
- 471 Paper sludge/pulp



- 481 Tetraethyl lead sludge
- 491 Unspecified sludge waste

### Miscellaneous

- 511 Empty pesticide containers 30 gal, or more
- 512 Other empty containers 30 gal, or more
- 513 Empty containers less than 30 gallons
- 521 Drilling mud
- 531 Chemical toilet waste
- 541 Photochemicals/photoprocessing waste
- 551 Laboratory waste chemicals
- 561 Detergent and soap
- 571 Fly ash, bottom ash, and retort ash
- 581 Gas scrubber waste
- 591 Baghouse waste
- 611 Contaminated soil from site clean-ups
- 612 Household wastes
- 613 Auto shredder waste

**Table IV**

|                                                 |    |                        |
|-------------------------------------------------|----|------------------------|
| 01 Recycle                                      | 14 | Transfer Station       |
| 02 Injection Well                               | 15 | Tank Treatment         |
| 03 Landfill                                     | 16 | Treatment Pond         |
| 04 Land Application                             |    | (Excludes evaporation) |
| 06 Surface impoundment                          | 99 | Other                  |
| 07 Thermal Treatment<br>(includes incineration) |    |                        |

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## Chapter & Lecture Notes:

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

*Comprehensive Environmental Response Compensation  
& Liability Act (CERCLA)  
Superfund Amendments & Reauthorization Act (SARA Title III)  
29 CFR 1910.120 OSHA's Final Rule  
California Health & Safety Code 6.95, 1158 & Section 25400  
California Vehicle Code 2453 & 2454*

# Liability and Risk Management

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On completion of this chapter the student will be able to:

1. *Describe* the major state and federal legislation that affects emergency responder's liability
2. *Compare* and contrast civil and criminal liability
3. *Define* the term negligence, and describe the various forms
4. *Restate* the types of penalties that can be imposed for negligence
5. *Differentiate* between Vicarious, Landowner, and Joint and Several liability
6. *Describe* the immunities and defenses available to public agencies
7. *Demonstrate* competency in conducting in Risk Assessment and Risk Management Techniques

## Background

Legal liability in hazardous materials incidents involves a complex system of laws, torts and statutes that are as varied and numerous as the mix of chemicals encountered in the world of hazardous materials. Prior to the famous “Watergate” cover-up incident—which implicated many members of the federal government in illegal activities—certain “**immunity**” laws protected public agencies from various forms of liability. However, since the “Watergate” incident, the courts have been making it increasingly easier and more profitable to sue public entities. For instance, California Government Code Section 850 states that there is no liability to provide, or maintain, a fire protection service unless a “**special relationship**” has been established. It may be possible to construe from this particular immunity law that a fire agency cannot be held liable for negligently fighting a fire, or even for not responding to a fire, however, it would only take something so simple as the communications dispatcher, on receipt of an alarm, indicating that the fire department would respond to the fire, for a special relationship to be established. Furthermore, once a fire agency *does* actually respond to the emergency, a special relationship has definitely been established and the agency is therefore liable for all its actions. If a special relationship can be shown to exist, as in the above mentioned example, the actions of the fire agency would **not** be protected under the immunity laws—the agency has a *duty*, a moral obligation, to complete the activity with reasonable care.

The situation now exists where government agencies can be just as easily sued for liability as any private corporation. Moreover, in this day and age, where the political and social climate regarding hazardous materials is such an extremely sensitive issue, the ramifications resulting from negligent actions can have very serious consequences for Incident Commanders and their respective agencies.



## Civil Court and Criminal Court Penalties

Liability cases can be heard in either the civil court system or criminal court system, depending on the type of liability involved. **Criminal liability** is the *accountability* of an individual under criminal law (i.e., Penal Codes, Vehicle Codes, Health & Safety Codes). Criminal cases are prosecuted by an Attorney General or District Attorney in an attempt to prove that a crime has been committed (an “unlawful act” as described in the criminal codes). Penalties for criminal liability involve jail or prison terms, and/or extensive fines.

**Civil liability** is the accountability of an individual under civil law (i.e., Civil Codes, Government Codes, Health & Safety Codes). The purpose of civil action is to recover any losses incurred by injured parties and to create behavioral changes in defendants. Civil courts can **award compensation for damages** to an injured party (plaintiff) from the person causing injury (defendant), and divide and assign a degree of responsibility for the damages incurred in cases involving multiple defendants.

Civil actions may be brought at the federal or state level. If a negligent action, or lack of action, was taken due to a mistake and not due to an exercise of malice on the part of the defendant, the case will most probably be heard in a state court system. If an act of malice, or oppression of an individual’s civil rights, is involved, the matter will often be litigated in the federal court system under the appropriate sections of the Federal Civil Rights Act. If an incident commander indiscriminately mandated the closure and evacuation of an area at a hazardous materials incident (under Penal code 409.5)—without probable cause to believe that the evacuated persons were actually in danger—the commander could be held liable for denying those individuals their civil rights. Therefore, it is strongly recommended that incident commanders only order a **mandatory** closure of areas *known* to be in danger, while making an advisory or **voluntary** evacuation of the surrounding areas if they “*want to be on the side of safety.*”

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The purpose of civil action is to recover any losses incurred by injured parties, and to create behavioral changes in defendants. Civil courts can **award compensation for damages...**

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The penalties or damages for negligence can be assessed against a defendant or their agencies as follows:

1. **Compensatory damages**—to pay restitution for loss of wages or expenses, and for the repair or replacement of property.
2. **General damages**—to pay restitution for general pain and suffering.
3. **Punitive damages**—punishment for outrageous conduct (gross negligence). Punitive damages must be *paid by the individual or employee* that committed the gross negligence. Under punitive damages the employee is not protected by Respondeat Superior (explained later in the chapter). However, under California law, an individual does have ten days in which to appeal to their own agency in order to have the damages paid for them by the agency. This matter is left purely for the individual's agency to decide. Punitive damages can't be avoided by filing bankruptcy, and there is no limit to the amount of punitive damages.
4. **Nominal damages**—an award of one dollar by the court when a case concerns matters of principal or difference of opinion where no damages are involved.

## Types of Civil Liability & Legal Terminology

Due the complexities surrounding the subject of liability, the following outline has been included in an *attempt to simplify* the legal terms and concepts that all potential incident commanders should be aware of. The term "liability" is relatively broad, but can be thought simply as "**accountability** for one's actions." In general, the three major categories of liability that have the most effect on responders to hazardous materials incidents are as follows:

1. **COMMON LAW NUISANCE**
2. **COMMON LAW NEGLIGENCE (TORT LAWS)**
3. **STRICT (STATUTORY) LIABILITY**

## Common Law Nuisance

A nuisance can be defined as any activity which substantially and unreasonably interferes with the use and enjoyment of property (private nuisance), or has an impact on the public's health and safety (public nuisance). Both private and public nuisance actions are used extensively to obtain relief from continuing releases of hazardous substances. Common law nuisance acts on the premise that a hazardous materials spill constitutes a "nuisance" as defined in civil codes and therefore, the spiller can be sued by a complainant to clean up the spill. Obviously, this law usually involves the hazardous material *polluters* rather than the emergency responder.

## Common Law Negligence

### Tort of Negligence

A tort can be defined as any **wrongful act** that is done willfully or negligently, causing damage or injury, but *not* involving a breach of contract. Once an "intentional tort" (willful) or "tort of negligence" has been established in a civil suit, a judge or jury determines the extent to which a defendant (the party being sued) is liable for losses incurred by the plaintiff (the injured party). If the plaintiff is found to have contributed to the loss or injury, the court may assign a portion of the liability for the loss to the plaintiff. Once the proportions for liability have been established, the court determines the extent of damages. This may include: cost of repair or replacement of property damage, loss of income of the plaintiff, a monetary award for physical injury or emotional stress of the plaintiff and all or a portion of the plaintiff's legal costs.

In a civil suit the following three elements must be satisfied before a "tort of negligence" can arise:

#### 1. Duty of Care Relationship

It must be shown that the defendant owed a "duty of care" to the plaintiff which was *violated* (breached) by the defendant. The relationship between public health/safety agencies and individual citizens during an emergency response constitutes such a relationship.

---

A **tort** can be defined as any *wrongful act* that is done willfully or negligently causing damage or injury...

---

## 2. Standard of Care

Once a duty of care has been established, it must be determined whether the defendant failed to conform to the *standard* of care imposed by the law of negligence. The test of reasonableness is applied, based on the defendant's level of knowledge and expertise. For example, did the defendant perform in a manner that conforms with accepted technical standards of practice, i.e. as per the standards contained in the federally mandated 29 CFR 1910.120 Final Rule?

## 3. Loss or Damage

Once it is established that a duty of care existed, and that a standard of care had been violated by the defendant, it must be further determined whether there was an actual loss or damage suffered by the plaintiff as a result of the defendant's negligent conduct. For example did the defendant's failure to isolate and deny entry to an incident involving a poison liquid spill cause the plaintiff to become acutely contaminated? If it is found that the defendant's error was caused by inadequate or improper training, the defendant's agency could also be found negligent in this suit (see vicarious liability below).

## Definition of Negligence

Negligence is the failure to exercise prudent judgement in carrying out an action where an injury or damage may result. The doctrine of negligence rests on the duty of every person to exercise due care in his or her conduct toward others in a situation where an injury or damage may result. Nevertheless, negligence can arise in almost any situation. In regard to public agencies and their personnel, the most common areas where negligent conduct might occur are in the following categories:

- Negligent supervision
- Negligent hiring or retention
- Negligent training
- Negligent misstatements
- Negligent assignment/appointment
- Negligent performance of duty

---

**Negligence** is the failure to exercise prudent judgement in carrying out an action where an injury or damage may result.

---



Employees must exercise **reasonable** and **prudent** judgement *while working within the scope of their employment*. To ensure that their employees act as reasonable and prudent people, employers are responsible for training their employees to specific standards. For example: It is expected that agencies who respond to hazardous materials incidents have trained their personnel to standards such as those specified in **NFPA 471** "Recommended Practice for Responding to Hazardous Materials Incidents, and **NFPA 472** "Standard for Professional Competence of Responders to Hazardous Materials Incidents." Attorneys will obviously compare the employee's actions against these nationally accepted standards to determine if, in fact, prudent judgment was used. As prudent and reasonable behavior can be measured, employees could be found to be negligent if they failed to perform to these standards. However, if the employee's *supervisor* fails to adequately train the employee to the above standards, the supervisor can be found ***vicariously negligent***. Because of this, civil suits brought by individuals against public agencies are more often found to be the result of an action performed by an officer (negligent supervision, hiring, retention), or for a duty an officer neglected to perform (i.e., training), or for a responsibility an officer delegated negligently (negligent assignment).

---

If the employee's supervisor fails to adequately train the employee to (recognized) standards, the supervisor can be found **vicariously** negligent.

---

### **Vicarious Liability**

Vicarious liability is the legal term used to describe *responsibility for the acts of another person*. In other words, employers are legally responsible for the actions of their employees. An agency, or an agency's supervisor, could well be found financially liable for damages *caused by an employee while working within the scope of his/her employment* if it can be shown that the agency, or supervisor, was negligent in the hiring, retaining, training, supervising, or assigning of the employee. For example, an Incident Commander appoints an employee to the position of Safety Officer on a hazardous materials incident, and that employee is not qualified or adequately trained for the task. The Incident Commander could be found vicariously negligent if that Safety Officer permits an unsafe practice that causes damage or injury. This could be vicarious negligence by way of negligent assignment/appointment and/or training. However, if the Safety Officer is qualified, or has been adequately trained to perform this function and *chooses to go beyond his/her scope of employment* (for instance, by entering a hot zone without protective clothing to rescue a victim) the Safety Officer's action could be considered *simple* negligence.

---

**Joint & Several:** if there are several defendants and only one has the financial means to pay the award, that one defendant becomes liable for ALL of the award.

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### **Respondeat Superior**

Under “respondeat superior,” Latin for “let the master answer,” an employer (master) is responsible for the provision of care by an employee (servant) toward those to whom an employer owes a duty of care, provided that the failure of the employee to use such care occurred while working *within the scope of his/her employment*. If the employee was negligent (used imprudent judgement) while working within the scope of his or her employment, the employer is financially responsible for any damages caused by the employee. However, if the employee is negligent while acting *beyond his/her scope of employment*, this protection is no longer valid, and the employee can be *personally* sued as an individual.

### **Gross Negligence vs Simple Negligence**

An employee will be responsible for payment of damages if he or she acts in an outrageous manner (gross negligence) whether or not he or she was working within the scope of his/her employment. The following case study illustrates this concept:

*An Incident Commander arriving at the scene of a hazardous materials spill ordered two response team members to enter the hot zone without adequate protective clothing to begin taking samples. Due to their inadequate hazardous materials training and lack of protective clothing, the team members were overcome by the effects of the substances in the hot zone. No back-up rescue team was assigned to monitor and aid the two crew members, and they remained in the hot zone until a rescue could be organized and initiated. The two crew members received permanent injury from the effects of the hazardous materials.*

In this case, if it can be proved that the public entity (the fire department) did not provide adequate training to the Incident Commander, the Commander could be found *simply* negligent and Respondeat Superior would protect his/her personal finances. However, if the Incident Commander had adequate hazardous materials training, or was warned of the danger to the entry crew by a trained Safety Officer, the Commander could be considered *grossly* negligent and could then be required to pay a portion of the award for damages and a penalty for gross negligence (punitive damages).

## JOINT & SEVERAL LIABILITY

Joint and Several Liability, nicknamed “deep pocket liability,” is the concept of being responsible together *and individually*. This concept came about by the courts seeking to put more emphasis on the victim’s injury or damage, rather than the degree of negligence of the defendant. When two or more parties contribute to the damage done to another person, that person can sue and recover damages from all the wrongdoers, or from any one of them. If the injured party brings a successful suit against several defendants, each defendant is liable to pay a portion of the award that relates to the degree of the defendant’s responsibility for the damage. However, if a co-defendant is deemed unable to pay his or her part of an award, that portion of the award is spread out among the other co-defendants to pay, thereby increasing the remaining defendants’ financial liability. In fact, if there are several defendants and only one has the financial means to pay the award, that one defendant becomes liable for ALL of the award.

Due to this “deep pockets” concept, public entities are often named in a suit of negligence to guarantee payment of the awarded damage claim. For example, in a hazardous materials incident, a jury may decide that several individuals share responsibility for damages sustained during the incident. The award is set at \$500,000. Your agency, however, was involved in the emergency response to the accident, was found to have increased the damage due to a responder’s imprudent judgement (negligence) and was found to be 1% at fault, (\$5,000). If the other co-defendants are unable to pay their portion of the award, your agency, being solvent, is responsible for the *full award* of \$500,000.

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If the employee was negligent, the employer is financially responsible for any damages caused by the employee.

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## Landowner Liability

Property owners (of both real and personal property) have a moral and legal responsibility to ensure that their property is not a safety hazard to others. For example, a broken piece of equipment on a response vehicle causes damage or injury on an emergency response, the response agency could be held liable for negligence of Landowner Liability, if the agency could not show good faith in attempting to resolve the problem. Moreover, if as an employee, you noticed that a piece of equipment was missing or broken on a response vehicle, you could be held liable for negligence if you failed to report—or could not prove that you reported—that the fault existed. A dated, written official memo reporting and describing any faults and deficiencies could mean the difference between a

| Status   | Duty Owed              |
|----------|------------------------|
| Trepass  | Avoid Intentional Harm |
| Licensee | Warn of Hidden Defects |
| Invitee  | Inspect & Repair       |

successful civil suit and an unsuccessful one. Remember, it is an important part of your job to document your actions to protect yourself and your agency against law suits.

### **Policy Decisions vs Operational Decisions**

It is extremely important for supervisors to understand that there is a major distinction between policy and operational decisions, and that this distinction can affect the susceptibility of public agencies and their employees in a civil suit involving negligence. Generally, *governmental bodies* are not held liable for **policy** decisions—decisions made by a governing council or board, based on any number of considerations, i.e., budgetary constraints. A policy decision made by a governing body is considered “discretionary,” meaning that the decision is one the governmental authority can make, not the courts. However, governments can be held liable for **operational** decisions made by their employees. For example, if a Fire Board votes to eliminate the hire of a hazardous materials consultant, it is a policy decision that is not subject to legal action if a loss, damage or injury results. However, if a supervisor creates a work schedule that leaves a hazardous materials team understaffed, and a loss results from having inadequate manpower on an incident, this would be deemed as a operation decision and is subject to legal action for negligence. Due to this legal distinction, when a decision must be made that may affect the liability of an agency, it should be elevated to a policy decision whenever possible, thereby removing the susceptibility of legal action. Additionally, policy decisions should be written in sweeping, directional language that gives the operational workers room to perform their jobs.

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...when a decision must be made that may affect the liability of an agency, it should be elevated to a **policy** decision whenever possible, thereby removing the susceptibility of legal action.

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### **Strict (Statutory) Liability**

Strict liability is the accountability imposed directly through federal, state and local statutes and ordinances. Strict liability is covered in both civil and criminal codes. Some statutes serve solely to define the measures that should be used for the safe handling of hazardous materials, without actually stating that failure to comply would automatically impose liability for damages. However, if a suit for negligence is brought, these statutes can be used as standards and introduced as evidence as to whether the material was adequately or inadequately handled. On the other hand, some statutes do, in fact, establish technical standards, *and* impose strict liability, including both criminal and civil penalties, for failure to comply with the standards.

## Summary of Haz/Mat Legislation

The following list contains some of the major statutes (legislation) that affect the liability of hazardous materials responders. This is not intended to be a comprehensive listing, but merely a summary of the major legislation that incident commanders should become familiar with, in regards to standards of practice and training requirements.

### Comprehensive Environmental Response Compensation & Liability Act (CERCLA) 1980

The EPA has jurisdiction over the implementation of this important environmental clean-up legislation that was enacted in 1980 and significantly amended thereafter. CERCLA provides for the **identification** and **clean-up** of numerous hazardous materials waste sites. This law contains very stringent and comprehensive requirements pertaining to methods to be used for the evaluation and characterization of suspect sites, and provides for the routine listing and prioritizing of the sites that have been identified under the established system. The Federal **Superfund** was established by CERCLA in an attempt to assist in the clean-up of sites where hazardous materials have been released. The EPA has authority to collect clean-up costs from the responsible parties who have contributed to the environmental pollution at each of the identified sites. Clean-up funds come from fines and penalties, from taxes on chemical and petrochemical feed stocks and from the US Treasury Department. CERCLA is a result of serious environmental and public health problems that were experienced at the Love Canal area near Niagara Falls, New York, in August of 1978.

### Superfund Amendments & Reauthorization Act (SARA Title III) 1986

The initial purpose of this legislation was to reauthorize and modify CERCLA. However, in so doing, Congress also added **Title III** to this important environmental legislation. Title III deals with hazardous material emergency **planning** and the community's **right-to-know** about chemicals that are present in the community. It is intended to encourage and support local and state haz/mat planning efforts. SARA mandates that the individual states must implement management systems to oversee and initiate hazardous materials **reporting** and emergency planning activities. The law provides methods by which citizens and local governments can obtain infor-

mation about potential chemical hazards in the local community. Title III requires facilities to provide detailed inventory information pertaining to the storage of chemicals used at the facility. Facilities must also provide detailed and technically significant reports to governmental agencies. In addition, SARA **mandates notification** of releases of specified amounts of listed hazardous materials by employers. Notifications must be made to the National Response Center, and also to the appropriate governmental entities. This law was initiated in response to the chemical disaster that occurred in Bhopal, India in December, 1984.

### **29 Code of Federal Regulations 1910.120 (OSHA's Final Rule)**

This standard was developed by OSHA to ensure **protection of employees** who are involved in operations involving potential contact with chemicals and the unique hazards associated with hazardous material **emergency response** and hazardous **waste operations**. This is a very vital statute for the Emergency services as the specific needs of firefighters, EMS personnel, police officers, etc. had not been adequately addressed in prior legislation. The scope of this statute encompasses a whole spectrum of issues, including engineering controls, clean-up operations, site controls, emergency response contingency plans, personal protective clothing, medical surveillance, and training requirements. The specific **training requirements** contained in this legislation are based on the duties and functions to be performed by the employee, and are specifically designed to accommodate the following **competency levels**:

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**(OSHA'S FINAL RULE)** is a very vital statute for the Emergency services as the specific needs of firefighters, EMS personnel, police officers, etc. had not been adequately addressed in prior legislation.

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- ✓ **FIRST RESPONDER AWARENESS**
- ✓ **FIRST RESPONDER OPERATIONS**
- ✓ **HAZARDOUS MATERIALS TECHNICIAN**
- ✓ **HAZARDOUS MATERIALS SPECIALIST**
- ✓ **ON-SCENE INCIDENT COMMANDER**
- ✓ **HAZARDOUS MATERIALS TRAINER**

Yearly refresher training is also required under 29 CFR 1910, and fines can be assessed for non-compliance. The Interim Final Rule was enacted in August, 1987 was revoked when the Final Rule became effective March 6, 1990.

### **California Health & Safety Code**

Containing hundreds of codes relating to the safe practices of hazardous materials handling, the California Health & Safety Code was designed to provide health and safety practices for Californians. Section 25400 of the California Health and Safety Code provide certain *immunities* for public safety employees from liability for any injury caused by a safety employee's action while working within the scope of employment to abate or attempt to abate hazards — *unless the action taken was performed in bad faith or in a grossly negligent manner*. This protects emergency responders to some degree, however, it is now broadly interpreted by the courts, and the trend since the Watergate incident is to favor the victim of negligence over the defendant.

### **California Tort Claims Act, California Government Code**

The liability of California public entities is governed by the California Tort Claims Act. Section 815.6 of this statute imposes liability for a public entity's failure to discharge a "mandatory duty imposed by enactment that is designed to protect against the risk of a particular kind of injury" unless it establishes that "it exercised reasonable diligence to discharge the duty." This statutory liability basically makes the responding agency liable to *respond* to a hazardous materials emergency. The "mandatory duty" includes the responsibility to "correctly" handle the incident, making a response team liable for damages caused by mishandling an incident. This is a liability by statute—strict liability—not negligence.

### **Carpenter-Presley-Tanner Hazardous Substances Control Act**

This is often referred to as the “State Superfund” and is more restrictive than CERCLA. In contrast to the Federal Superfund, no limitations on liability or liable parties are set forth. Therefore, where costs are incurred, liability is strict for releases occurring after January 1, 1982. Depending on the court’s interpretation, there may be some instances in which liability for releases prior to this date will be determined by the common law of nuisance or negligence, rather than the State Superfund statute. The State Superfund also differs from federal law in expressly providing for apportionment of damages in cases where it is practical to determine the share of damages caused by a responsible party, instead of deferring to common laws of nuisance and negligence, which provides for joint and several liability.

### **California Vehicle Code 2453 & 2454**

It is stated under Section **2453** of the California Vehicle Code, that the **California Highway Patrol** shall serve as the state-wide information, assistance and notification **coordinator** for all hazardous substances spill incidents occurring on highways within the State of California. Furthermore, under Section **2454** it is stated that the authority for the **management** of the scene of an on-highway hazardous substance spill or disaster shall be vested in the appropriate law enforcement agency having primary traffic investigative authority on the highway where the spill occurs. The term “scene management” has often been used **erroneously** as being synonymous with **Incident Command**. It is important to understand that “scene management” is a coordination function only, and it does not imply that the scene manager will necessarily be in charge of mitigation operations or even in any type of Command mode.

**Note:** A city may amend their local emergency plan to provide for the fire department to be Incident Commander on a city controlled street or right of way.



## Risk Management

Risk Management can be thought of in terms of *risk assessment* and *liability prevention*. While you are evaluating or assessing your agency's policies, standards and response actions, ask yourself these simple questions. How can the victim's lawyer blame me for any damages? How can I *prove* my judgement was prudent three years from now, when the case finally goes to court? In California, lawyers often operate on a contingency fee basis. It is important to understand that this does not mean contingent on *winning*, but rather, contingent on *settling*! Remember, there is little or no risk involved in losing a suit and the potential for financial gain is great. Add this to the fact that there is at least one lawyer for every 250 people in California and you can see that financially solvent—and therefore attractive—public agencies must now step carefully at all times.

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The primary intent of **risk management** is to eliminate or reduce negligent actions and ensure public safety.

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Risk management is a formal, structured process designed to protect an organization's assets from possible loss through law suits, accidents, and so on. The primary intent of risk management is to eliminate or reduce negligent actions and ensure public safety. *Risk*, in insurance law, is "the potential for loss." It refers to the *probability* that an event will cause damage, injury or other adverse consequences. *Exposure* refers to a "possible sequence of events that can lead to damage or injury." Risk management expands existing policies, plan, and procedures to develop a methodical approach to safety and prevention, and encourages a comprehensive examination of practical and economic ways to reduce potential loss. Key principles in developing a good risk management program are: preparedness, documentation, comprehensiveness and professionalism.

Identifying loss exposures (possible sequences of events that can lead to damage or injury) is the first step of risk management. After identifying the exposures, the risks can be analyzed and management techniques can be chosen to prevent or reduce the potential for loss (successful suits or settlements.) The following list includes practical ways of obtaining information on possible events or proce-

### Risk Management Techniques

- Review your agency's loss claim history. (Have you been sued before? For what? By whom?)
- Review similar agency's loss claim history. (What kinds of suits have been brought against agencies similar to your own?)
- Review your policies, procedures and plans for inadequacies, out-datedness, vagueness, or restrictiveness. (Make sure your policies/procedures are what you want them to say. Review the wording for restrictiveness, i.e., the use of the word *should* instead of *shall* will give you more discretion in your actions.)
- Review your training methods and compare them with accepted standards (i.e. 29 CFR 1910.120). Is your training conducted on a regular basis and documented properly? Do you use video tapes of field exercises and written exams to verify your training?
- Establish criteria for performance standards, and enforce for all personnel.
- Ensure that every specialty officer is thoroughly trained and aware of legal considerations.
- Require thorough incident and investigation reports and document all response activities.
- Prepare or update your response plans or standard operating procedures to meet current standards and regulatory requirements.
- Obtain and maintain all necessary equipment to conduct response and recovery operations. Document your actions.
- Review business or facility risk management plans for compliance with regulations.
- Require complete facility inspection records and issue citations, or seek judicial instruction, when hazards are seen.
- Ensure that all clean-up contractors used are properly bonded and insured.
- Have your legal advisor review your policies and procedure related to hazardous materials response operations.
- Consult with legal counsel or municipal insurance agent regarding possible risks and exposures.

There are two ways to manage risks. The first is **risk control**, which prevents loss from occurring or reduces the severity of consequences, and the second is **risk financing**, which provides funds needed to pay for losses resulting from risk exposure. The less you involve controlling risks (prevention) the more you will need to plan for risk financing. A constant review and evaluation of your risk management program is necessary to ensure that it is being followed and that it is effective. Periodic review of policies and procedures enables administration to determine whether existing risk control and risk financing techniques are adequate.

## Practice Good Defenses

You can avoid paying damages in a civil suit or settlement if you develop your defenses through risk management planning. Good defenses include the following:

- ✓ Competent **TRAINING**
- ✓ Supporting **DOCUMENTATION**
- ✓ Pre-incident **PLANNING**
- ✓ Well known and **VALID** standard operating **POLICIES** and procedures
- ✓ Proper testing and **MAINTENANCE** of equipment.
- ✓ **EVALUATION** of results

**MOST IMPORTANT!**  
**ALWAYS REMEMBER TO**

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**DOCUMENT! DOCUMENT! DOCUMENT!**  
**TRAIN! TRAIN! TRAIN!**  
**AND THEN *DOCUMENT THE TRAINING!***



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## CHAPTER & LECTURE NOTES:

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# Documentation and Incident Investigation

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On completion of this chapter the student will be able to:

1. *Recognize* the need for documentation of hazardous materials incidents and identify who is responsible for documentation control.
2. *List* the various types of documentation that can be used to protect agencies and response personnel against costly suit settlements.
3. *Determine* what documentation will be necessary to ensure cost recovery and restitution, and to properly conduct an incident investigation.
4. *Recite* the Standard Operating Procedure for conducting an incident investigation from the Incident Commander's point of view, and how to maintain the chain of custody for evidence collected.
5. *Recite* the requirements for mandatory incident reporting of National Fire Incident Reporting System (NFIRS) program and *complete* a NFIRS Report Form.
6. *Describe* the requirement for medical monitoring and list the various components of an Exposure Record.

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...*all* employees must be aware of the need for documentation and must appropriately participate in the process.

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## Background

The purpose of documentation at a hazardous materials emergency is to *protect the agency and its personnel* from claims of negligence for improper operational actions. Documentation also serves in claiming *restitution* from state or federal clean-up funds, and also for purposes of criminal prosecution. Proper documentation becomes absolutely necessary for the investigation phase of an incident, and is also required for general record keeping. As civil and criminal cases can take years to get to court, adequate documentation will ensure that the facts can still be established at a much later date. It is important to save documentation for at least five years, or until the appeals process is completed. One or more employees should always be assigned the task of compiling and appropriately tracking the documentation process (see “document control” below). However, *all* employees must be aware of the need for documentation and must appropriately *participate* in the process. Documentation initiated in early stages of a hazardous materials incident will not only help to ensure the collection of accurate data, it will also serve to support and bring **credibility** to the initial action taken by first responders. Although the actual documentation of a hazardous materials incident should be started on the receipt of an alarm, the more formalized recording process and official reports must be started as soon as safety factors allow, and definitely before clean-up procedures are completed.

## Cost Recovery/Restitution

In order to ensure future **restitution** from the responsible party, or to enable cost recovery from governmental funding, documentation must include all information pertinent to the *costs involved in mitigating the incident* occurred by the agency, department, or jurisdiction. All costs must be documented and supported with **written materials**, such as damage reports, time cards, receipts and invoices.



## Document ALL Property Damage

All damage to property must be thoroughly documented with photographs before, during, and after clean-up. Whenever possible, **video tapes** should be taken of the incident scene during the various operational phases. Moreover, video taped statements of emergency responders and witnesses can also be used as a good source of documentation at a later date. Be sure that witness's statements include their names and addresses. Written descriptions, tags and labels, field notes, and logs should be used to document all actions taken. A property damage report must include location, degree of damage, description of damages and cost estimates, and must be supported with documentary evidence. Property owner information, such as name, address and phone number should also be included on the report. Property damage assessments should be completed for **all** property types: public, private, county, state and federal. This will ensure that a local emergency proclamation could access funds from the National Disaster Assistance Act or Superfund monies.

## Communications Dispatch Tapes

Requests should be made for copies of the communications dispatch tapes for all hazardous materials incidents that involve damage or loss. Chances for litigation increase directly with the monetary value of the damage. If a “**save**” request is not received, these tapes are often **erased** in a week or two to be used again in an effort to reduce costs by the communications center. Therefore, it is extremely important that the request for copies be made *immediately* after the incident. Dispatch tapes are excellent resources for documenting actions taken, resources requested, notifications made and sequencing factors. These tapes can be of paramount importance in a court action, because it has become common knowledge that communications are routinely recorded during an emergency incident. If an attorney asks for you to play these tapes in order to support your testimony and you cannot produce them because they had been erased, the attorney need only mention the word “Watergate,” alluding to a cover-up in order to diminish your testimony.

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Requests should be made for copies of the communications dispatch tapes for all hazardous materials incidents that involve damage or loss.

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## Documenting Fatalities

Documentation is not only vital for incidents that involve fatalities, it is also mandatory. The potential for litigation in these incidents is obviously enormous. The official **Patient Care Report** must include at least the following information:

- |                                                                |                                                 |
|----------------------------------------------------------------|-------------------------------------------------|
| • name, age, address of victim                                 | • rescue method/actions                         |
| • decontamination procedures                                   | • diagnostic surveys                            |
| • treatment rendered                                           | • transporting agency                           |
| • hospital destination                                         | • location and condition of victim upon arrival |
| • telephone numbers, etc. to reach relatives, etc. if possible |                                                 |

In certain situations, the decision may have to be made to delay any rescue attempts, due to lack of appropriate protective clothing, and to leave victims in a hazardous materials Exclusion Zone until the arrival of a hazmat response team. If this situation occurs, it is vital to fully document the **rationale** behind this decision *as soon as possible!* Field notes and radio messages can be used for this purpose during the incident. The sooner such decisions are officially recorded, the better for the investigation. Work connected fatalities and serious injuries require notification of the nearest CalOSHA office. Title 8, Chapter 3.2 Sec. 342.

## Chemical Sampling & Evidence Collection

On-scene emergency chemical sampling is not only used to determine or substantiate the identification of a spilled material, it is also an elemental and vital form of **evidence** documentation. Sampling techniques must be performed carefully because errors produced by poor sampling techniques can produce the weakest link in the quality of the data collected. The data on hazardous chemicals, once analyzed, will be a determining factor on how responders will approach the incident and how clean-up activities will be accomplished. For this reason, chemical sampling should not be rushed into.

Chemical sampling and testing at emergency responses has been developed to be as simple and complete as current technology allows. However, these **field tests** are obviously **not** as accurate as environmental testing in a laboratory and the results of these tests should be analyzed with this aspect in mind.

Emergency sampling techniques must also take into consideration the cumbersome suits worn by the team members taking samples and the fatigue factors resulting from wearing these suits. The methods used for emergency sampling must be suitable to a wide range of situations and applications because of the **unknown** nature of many hazardous materials spills. Sampling be performed as expeditiously as possible to minimize personal exposure. Field testing methods must allow for a full gamut of tests from gross compatibility analysis, such as pH, flammability, water reactivity, etc., to highly sophisticated techniques capable of resolution in the parts per billion (ppb) range.

The basic objective of any sampling operation is to produce a set of samples representative of the source under investigation and therefore suitable for **subsequent analysis**. More specifically, the objective is to acquire information that will assist in identifying unknown compounds present and assess the extent to which these compounds have become integrated into the surrounding environment. Subsequently, this information will not only be used by responders in the development of remedial actions, but may also be used in future **litigation** as well. The accuracy of sampling cannot be overstressed, not only to ensure the well being of responders, but also for the accurate collection of evidence. At least **three samples** of adequate quantities should be taken, with due importance given to accurate and complete labeling. Sampling may have to be accomplished by a variety of personnel depending on the conditions, potential hazard and quantity of the spill. Initial sampling will probably be performed by **qualified** hazardous materials response team members. Later, the EPA, Fish & Game or another agency may send other qualified personnel to take more samples in the field.

Although Incident Commanders are **not** directly responsible for taking chemical samples, they are however, responsible for ensuring that samples are taken in a reasonable, safe and professional manner. Moreover, the Incident Commander is responsible for **documenting** the sampling process and for establishing the **chain of custody** for the evidence. Also, as the Incident Commander is responsible for the incident as a whole, ensuring that sampling was done in a professional manner gives a greater chance of success to the entire operation.

## Documentation Control

All information pertinent to field activities, including sampling, will be recorded in various forms, such as logbooks, sample tags, photographs, etc. Proper documentation and *documentation control* are crucial factors with regard to enforcement actions and they may also prove to be critical in establishing a defense for any agency involved in civil suits or settlements. Photographs and video taken before, during and after the event are the most accurate record of the responders' observations. Remarks regarding photos and video footage should be written in a notebook or computer specifying the following:

- date and time
- signature of the photographer
- name and identification number of the incident
- general direction faced when taking the photo/video
- a brief objective description of the scene
- location
- sequential number of the photo and the role number

Comments of the photographer must be limited to those listed above, as any **subjective** remarks (opinion) could jeopardize the legal value of the evidence. Telephoto and wide angle shots cannot be used in enforcement proceedings—only views that could be seen with the **naked eye** are acceptable in court.

Formal hearings in civil suits or criminal prosecution often hinge on the evidence that was gathered at the scene. The purpose of document control is to assure that all documents are accounted for when the incident is completed. Documentation should include such items as:

- |                               |                                          |
|-------------------------------|------------------------------------------|
| • logbooks                    | • field data records and notes           |
| • correspondence              | • photographs/video tapes                |
| • chemical data information   | • chain-of-custody records               |
| • chain-of-command charts     | • communications tapes                   |
| • written or taped interviews | • damage/incident reports                |
| • weather condition report    | • names/addresses of responsible parties |
| • resources & funds expended  | • diagrams of the incident               |
| • actions taken               | • casualties & exposure records          |
| • medical treatment           | • Chemical Exposure Records              |
| • NFIRS report                |                                          |
| • witness's statements        |                                          |

On many occasions, grease pencils and plastic white boards are used to make sketches of the incident scene or to draw ICS organizational charts. In order to maintain documentation control, these sketches should be **photographed** or recorded on a sheet of paper before they are *erased*.

Each document should bear the incident's assigned number and an item specific **serial number**. The documentation should be listed, with its serial number, in a project document **Inventory Control logbook** assembled at the project's completion. **Waterproof ink** must be used in recording all data in documents bearing serial numbers. Therefore, waterproof ink pens should be made available at the scene.

## Chain Of Custody

To support litigation, the department must be able to provide the chain of possession or custody of any samples or documents offered as evidence. This must be done in order to demonstrate that the materials were in a specific responsible person's hands at all times, and not **substituted** or **tampered** with. Written procedures should be established and followed whenever evidence samples are collected, transferred, stored, analyzed or destroyed. The primary objective of these procedures should be to create an accurate written record which traces the possession and handling of the evidence from the moment of its *collection*, through the *analysis* phase, to its introduction as *evidence*. Therefore, the number of people involved in handling evidence should be kept to a minimum. When transferring evidence, the transferee should sign a **chain-of-custody logbook**, recording the date and time of the transfer. This logbook should be in the form of a bound notebook with numbered pages.

Rule 803 (6) of the Federal Rules of Evidence (PL 93-575) states that written records of regularly conducted business activities may be *introduced* into evidence, in exception to the "hearsay rule," *without testimony* of the person(s) who actually made the record. For this reason, it is important to **standardize** the procedures for documenting an incident and for collection of evidence. Reports that might later be introduced as evidence should be as *accurate* and as *objective* as possible. In criminal cases however, oral testimony is often also required.

## Medical Monitoring

Under the requirements of 29 CFR 1910.120, medical monitoring for emergency response personnel is **mandatory** and must therefore be documented. This statute contains separate monitoring requirements for the different operational levels of service performed by response personnel. The definition of “first responder” under this ruling has been the subject of much debate. However, it seems reasonable to deduce from the regulation that **any responder** that is involved in an incident is entitled to at least **post incident** monitoring, and that the responders that are more heavily involved in actual mitigation operations, such as a haz/mat team members, are entitled to annual monitoring on a **pre- and post-incident basis**.

**Personal Chemical Exposure Records** are required to be documented in an employee’s work records for any exposure or possible exposure to hazardous materials. A medical surveillance record shall be retained by all employers for each employee who has been exposed to a hazardous material. At a minimum, the exposure records should contain the following information, and must also be made available to the employee:

- Name and social security number
- Date, time, location of the incident and incident number
- Physician’s written opinion, treatment, recommended limitations and results of examinations and tests.
- A copy of information provided to the examining physician by the employer.
- Type, concentration and duration of exposure.
- Name of chemical or material involved in the incident.

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Medical monitoring for emergency response personnel is mandatory and must therefore be documented.

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## Proposition 65 Reporting Requirements

### Safe Drinking Water and Toxics Enforcement Act of 1986

With the passage of California's Safe Drinking Water Initiative, Proposition 65, it is now mandatory for responsible parties, and for certain pre-identified government employees, to report discharges of hazardous substances that could result in reaching the State's ground water tables. This initiative was instigated primarily as a measure to prevent any releases occurring from underground tanks from being ignored or disregarded. Under this law, if a hazardous substance has been released, the responsible party must notify the State Water Quality Control Board and the local administering agency within seventy-two (72) hours of the release occurring. The civil penalties can be up to \$2500 per day for noncompliance, such as for not reporting that an underground tank monitoring system is in the alarm mode. Moreover, it is also required for the *administering* agency to also notify the County Board of Supervisors and County Health Department within seventy-two hours of receiving notification, or discovering, that a release has actually occurred.

It is extremely important for potential Incident Commanders to know which agency is considered as being the *administering agency* for their particular jurisdiction. Especially as the local fire department has been identified as being the administering agency for many cities and counties in California. Obviously, if this is actually the case in your jurisdiction then you as the Incident Commander must ensure that all Proposition 65 reporting requirements are fully complied with. However, if you are employed in a jurisdiction in which another agency—such as the local County Health Department—has been determined to be the administering agency, then as the Incident Commander you must ensure that particular agency is properly notified if a incident involves a release that has the potential for contaminating ground water supplies.

## Incident Investigation

Incident investigations are conducted to assess legal responsibility for the incident, assess damages and losses, ensure cost recovery, conduct criminal prosecution and ensure that actions taken by responders are appropriate. In California, the State's *Hazardous Materials Incident Contingency Plan* and the State's *Oil Spill Contingency Plan* **require** the scene manager to make sure that an investigation is properly performed. However, when criminal prosecution is likely to be pursued, the investigation should be performed by a criminal investigator who is trained in search and seizure laws and is familiar with arrest procedures. If, during a criminal investigation, it is discovered that no actual crime has been committed, then the investigation can revert to a simple civil action.

While an investigation is in progress, the Incident Commander must ensure that the investigator is made aware of the potential dangers presented by the hazardous materials involved in the incident. When necessary, the investigator must be supplied with the appropriate protective equipment. However, investigators must not be allowed to don or wear any specialized equipment for which they have not been trained (i.e., fully encapsulating suits and breathing apparatus).

The following is a suggested Standard Operating Procedure that Incident Commanders should follow in conducting an investigation, you should have your local D.A. check your SOP before it is adopted.

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...when criminal prosecution is likely to be pursued, the investigation should be performed by a criminal investigator who is trained in search-and- seizure laws and is familiar with arrest procedures.

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- Contact the District Attorney's Office and request that an investigator be sent to the scene.
- Provide the investigator with expertise regarding the hazards of the chemicals present at the incident.
- Maintain the control and security of the incident scene, so as to preserve the chain of evidence.
- Preserve any evidence while waiting for the investigator to arrive.
- Continue to document the incident using photograph, video tapes, audio tapes, or any other means that will preserve the incident scene until the investigator arrives.
- Continue the documentation process.



Do not hesitate to call for specialized investigators, such as those provided by the **United States Coast Guard** for spills affecting navigable waterways, the **Department of Fish and Game** for spills threatening wildlife, and **Narcotic Enforcement Teams** for drug related incidents.

It is important to remember that having an investigator on the incident scene does not relieve the Incident Commander from the responsibility to ensure proper documentation. Document the incident in a manner that allows total recall of *exactly* what happened—possibly in a court room setting—three years after the incident took place.

It is the Incident Commander's responsibility to follow-up on the investigation and participate with the investigator in discussing the facts of the case to assure completeness. The Incident Commander has the responsibility of providing a summary report (a compilation of the numerous reports of the incident from the participating agencies) as well as providing the Incident Manager's Report.

## **Group Exercise Session #5**

This final group exercise is intended to reinforce the main points presented in this course. In the first part of the exercise, students are required to complete a NFIRS Report Form for the scenario/incident involving the Ethylene Dibromide and the Ethylene Oxide. The second part of the exercise is designed to provide the student with the opportunity to demonstrate competency in establishing accountability as an Incident Commander. This will be accomplished by having the students attempt to justify—in a civil court room setting—their actions taken previously during the exercises conducted earlier in this course.

In a study-group format, the students are to prepare a defense for a simulated tort of negligence civil action suit. The only facts established so far, are that this action is being taken against the fire agency and the individual students for the negligent management of the scenario/incident involving the Ethylene Dibromide and the Ethylene Oxide.

Each group should jointly prepare a defense to answer for negligent supervision, training, assignment, and performance of duty. Each group member should be fully prepared to answer, on the witness stand, some of the following questions:

- Q. What qualifies you to command a hazardous materials emergency incident?
- Q. Describe, and provide the rationale behind, the emergency actions that were actually taken at the incident in question.
- Q. What functions were you personally responsible for at the incident in question?
- Q. What actions were actually taken to protect the public, the environment and property?
- Q. Explain to the jury your agency's Standard Operating Procedure for responding to incidents involving hazardous materials?
- Q. What rationale did you use to determine the actual area to be closed to the public during this incident?
- Q. What methods were used to document this incident?

[illegible]



# Appendices

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Appendix A: CAMEO Response Information Data Sheets

Appendix B: Reference Source Examples

Appendix C: Hazardous Materials Plans

Appendix D: Material Safety Data Sheets

Appendix E: Incident Command Worksheet



**HAZARDOUS MATERIALS ON-SCENE  
INCIDENT COMMANDER**

# Appendix A

## CAMEO Response Information Data Sheets

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**HAZARDOUS MATERIALS  
COMMAND 2B**



RESPONSE INFORMATION DATA SHEET, VERSION 2.0  
NOAA - 7600 SAND POINT WAY N.E. SEATTLE, WA 98115 (206) 526-6317

CAS Number 106934 ETHYLENE DIBROMIDE  
NFPA Degrees of Hazard  
Health: 3  
Flammability: 0  
Reactivity: 0  
Special:

1) GENERAL DESCRIPTION:

Ethylene dibromide is a clear colorless liquid with a sweetish odor. It is used as a solvent, as a grain fumigant, in the manufacture of other chemicals, and for many other uses. It is heavier than water and slightly soluble in water. It is non-combustible. It can cause illness by inhalation, skin absorption and/or ingestion. ((C)AAR, 1986)

2) FIRE HAZARDS:

Not flammable. POISONOUS GASES ARE PRODUCED WHEN HEATED. Decomposition gases are toxic and irritating. Decomposes into toxic irritating gases. Reacts with hot metals such as aluminum and magnesium. (USCG, 1985)

3) FIRE FIGHTING:

Extinguish fire using agent suitable for type of surrounding fire (material itself does not burn or burns with difficulty). ((C)AAR, 1986)

4) PROTECTIVE CLOTHING:

Keep upwind. Wear boots, protective gloves, and goggles. Avoid breathing vapors or dusts. Wash away any material which may have contacted the body with copious amounts of water or soap and water. ((C)AAR, 1986)

Butyl: Good Resistance/Limited Data.  
Chlorobutyl:  
Chlor Rub:  
CPE: Poor Resistance/Limited Data.  
CR 39:  
EVA PE:  
FEP TFE: Good Resistance/Limited Data.  
Hypalon:  
NBR:  
Neoprene: Poor Resistance/Good Data.  
Neo Rub:  
Neoprene SBR:  
Nitrile: Poor Resistance/Limited Data.  
Nitrile PVC:  
PE: Poor Resistance/Good Data.  
Polycarb:  
PU:  
PVA: Good Resistance/Limited Data.  
PVC: Poor Resistance/Limited Data.  
Rubber: Poor Resistance/Good Data.  
Rub Neo NBR:  
Rub Neo SBR:  
Saranex:  
SBR:  
Viton: Good Resistance/Limited Data.  
Viton Neo:

5) HEALTH HAZARDS:

## HAZARDOUS MATERIALS COMMAND 2B

RESPONSE INFORMATION DATA SHEET, VERSION 2.0

NOAA - 7600 SAND POINT WAY N.E. SEATTLE, WA 98115 (206) 526-6317

CAS Number 106934

ETHYLENE DIBROMIDE

VAPOR: POISONOUS IF INHALED. Irritating to eyes, nose and throat. LIQUID: POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin and eyes. (USCG, 1985)

### 6) NON-FIRE RESPONSE:

Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash or cement powder. Apply "universal" gelling agent to immobilize spill. Water spill: Use natural deep water pockets, excavated lagoons, or sand bag barriers to trap material at bottom. If dissolved, apply activated carbon at ten times the spilled amount in region of 10 ppm or greater concentration. Remove trapped material with suction hoses. Use mechanical dredges or lifts to remove immobilized masses of pollutants and precipitates. ((C)AAR, 1986)

### 7) FIRST AID:

If this chemical comes in contact with the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical. If this chemical comes in contact with the skin, immediately wash the contaminated skin with soap and water. If this chemical penetrates through the clothing, immediately remove the clothing, wash the skin with soap and water, get medical attention promptly. If a person breathes in large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible. If this chemical has been swallowed, get medical attention immediately. (NIOSH, 1987)

### 8) PROPERTIES:

Flash Point: Not Applicable. Not flammable. (USCG, 1985)  
Lower Exp Limit: Not Applicable. Not flammable. (USCG, 1985)  
Upper Exp Limit: Not Applicable. Not flammable. (USCG, 1985)  
Auto Ign Temp: Not Applicable. Not flammable. (USCG, 1985)  
Melting Point: 49.6 Deg F (USCG, 1985)  
Vapor Pressure: 10.81 mm Hg @ 70 Deg F (USCG, 1985)  
Vapor Density: Not Applicable. (USCG, 1985)  
Specific Gravity, Liquid: 2.18 @ 68 Deg F (USCG, 1985)  
Specific Gravity, Solid:  
Boiling Point: 268 Deg F @ 760 mm Hg (USCG, 1985)  
Molecular Weight: 187.86 (USCG, 1985)  
IDLH: Not applicable, potential human carcinogen. (NIOSH, 1987)  
TLV TWA: Skin. ((C)ACGIH, 1986)  
TLV STEL:

RESPONSE INFORMATION DATA SHEET, VERSION 2.0  
NOAA - 7600 SAND POINT WAY N.E. SEATTLE, WA 98115 (206) 526-6317

CAS Number 629141 ETHYLENE GLYCOL DIETHYL ETHER  
NFPA Degrees of Hazard  
Health:  
Flammability:  
Reactivity:  
Special:

1) GENERAL DESCRIPTION:

Ethylene glycol diethyl ether is a clear colorless liquid with a faint ether-like odor. It has a flash point of 100 deg F. It is lighter than water and insoluble in water. Its vapors are heavier than air. ((C)AAR, 1986)

2) FIRE HAZARDS:

Combustible. (USCG, 1985)

3) FIRE FIGHTING:

Do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Use "alcohol" foam, carbon dioxide or dry chemical. ((C)AAR, 1986)

4) PROTECTIVE CLOTHING:

Avoid breathing vapors. Keep upwind. Wear boots, protective gloves, and goggles. Do not handle broken packages without protective equipment. Wash away any material which may have contacted the body with copious amounts of water or soap and water. ((C)AAR, 1986)

Butyl: Poor Resistance/Limited Data.

Chlorobutyl:

Chlor Rub:

CPE: Good Resistance/Limited Data.

CR 39:

EVA PE:

FEP TFE:

Hypalon:

NBR:

Neoprene: Poor Resistance/Limited Data.

Neo Rub:

Neoprene SBR:

Nitrile:

Nitrile PVC:

PE:

Polycarb:

PU: Poor Resistance/Limited Data.

PVA:

PVC:

Rubber: Poor Resistance/Limited Data.

Rub Neo NBR:

Rub Neo SBR:

Saranex:

SBR:

Viton:

Viton Neo:

5) HEALTH HAZARDS:

VAPOR: Irritating to eyes, nose and throat. LIQUID: Irritating to skin and eyes. Harmful if swallowed. (USCG,

**HAZARDOUS MATERIALS  
COMMAND 2B**

RESPONSE INFORMATION DATA SHEET, VERSION 2.0  
NOAA - 7600 SAND POINT WAY N.E. SEATTLE, WA 98115 (206) 526-6317

CAS Number 629141 ETHYLENE GLYCOL DIETHYL ETHER  
1985)

6) NON-FIRE RESPONSE:

Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Use water spray to knock-down vapors. ((C)AAR, 1986)

7) FIRST AID:

INHALATION: remove from exposure. EYES: flush with water for at least 15 minutes. SKIN: wash with copious amounts of water. INGESTION: drink water and get medical attention. (USCG, 1985)

8) PROPERTIES:

Flash Point: 90 Deg F o.c. (USCG, 1985)  
Lower Exp Limit:  
Upper Exp Limit:  
Auto Igtn Temp: 406 Deg F (USCG, 1985)  
Melting Point: -101 Deg F (USCG, 1985)  
Vapor Pressure: 308.27 mm Hg @ 214 Deg F (USCG, 1985)  
Vapor Density: 4.1 (USCG, 1985)  
Specific Gravity, Liquid: 0.8484 @ 68 Deg F (USCG, 1985)  
Specific Gravity, Solid:  
Boiling Point: 252 Deg F @ 760 mm Hg (USCG, 1985)  
Molecular Weight: 118.2 (USCG, 1985)  
IDLH:  
TLV TWA:  
TLV STEL:

RESPONSE INFORMATION DATA SHEET, VERSION 2.0  
NOAA - 7600 SAND POINT WAY N.E. SEATTLE, WA 98115 (206) 526-6317

CAS Number 75218                      ETHYLENE OXIDE  
NFPA Degrees of Hazard  
Health: 2  
Flammability: 4  
Reactivity: 3  
Special:

1) GENERAL DESCRIPTION:

Ethylene oxide is a clear, colorless, volatile liquid with an ethereal odor. It is used to make other chemicals, as a fumigant and industrial sterilant. It has a flash point of less than 0. deg F., and is flammable over a wide vapor-air concentration range. The material has to be diluted on the order of 24 to 1 with water before the liquid loses its flammability. If contaminated it may polymerize violently with evolution of heat and rupture of its container. The vapors may burn inside a container. The vapors are irritating to the eyes, skin, and respiratory system. Prolonged contact with the skin may result in delayed burns. It is lighter than water and soluble in water. The vapors are heavier than air. ((C)AAR, 1986)

2) FIRE HAZARDS:

Severe explosion hazard when exposed to heat or flame. Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. Vapor forms explosive mixtures with air over a wide range. Liquid is not detonable but the vapor may be readily initiated into explosive decomposition. Avoid contact with air, heat, acids and bases; metal or metal chloride catalysts; covalent halides such as chlorides of aluminum, iron (iii), tin (iv); basic materials like alkali hydrides, ammonia, amines, and potassium; catalytically active solids such as aluminum or iron oxides or rust; some carbonates; and metals such as copper and copper alloys. Hazardous polymerization reaction may occur. Incompatible with metal fittings containing silver, mercury or magnesium; pharmaceutical substances; vitamins; amino acids; food constituents; oxidizing agents; organic bases; certain salts; alcohols; mercaptans; magnesium perchlorate; M-nitroaniline; trimethylamine; potassium chloride; contaminants; alkanethiols; bromoethane. Decomposition products are explosive. Irritating vapors are generated when heated. (EPA, 1986)

3) FIRE FIGHTING:

Extinguish with alcohol foam, carbon dioxide, dry chemical or water spray, fog, or foam. Let burn unless leak can be stopped immediately. Move container from fire area if you can do so without risk. Stay away from ends of tanks. Fight fire from maximum distance. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire. (EPA, 1986)

4) PROTECTIVE CLOTHING:

Wear positive pressure breathing apparatus and full protective clothing. Wear proper eye protection. (EPA, 1986)

Butyl: Good Resistance/Limited Data.  
Chlorobutyl:  
Chlor Rub:  
CPE: Good Resistance/Limited Data.  
CR 39:  
EVA PE:  
FEP TFE:  
Hypalon:  
NBR:  
Neoprene: Poor Resistance/Limited Data.  
Neo Rub:  
Neoprene SBR:  
Nitrile: Good Resistance/Limited Data.

## HAZARDOUS MATERIALS COMMAND 2B

RESPONSE INFORMATION DATA SHEET, VERSION 2.0  
NOAA - 7600 SAND POINT WAY N.E. SEATTLE, WA 98115 (206) 526-6317

CAS Number 75218 ETHYLENE OXIDE

Nitrile PVC:

PE:

Polycarb:

PU:

PVA:

PVC: Poor Resistance/Limited Data.

Rubber: Poor Resistance/Limited Data.

Rub Neo NBR:

Rub Neo SBR:

Saranex:

SBR:

Viton: Poor Resistance/Limited Data.

Viton Neo:

### 5) HEALTH HAZARDS:

It can cause death. Low toxic concentration when inhaled is 12500 ppm/10 seconds. It is a strong skin irritant. Neurological disorders and even death have been reported. Signs and Symptoms of Exposure: Low vapor concentration often results in delayed nausea and vomiting. Higher concentration produces irritation of eyes, nose and throat. (EPA, 1986)

### 6) NON-FIRE RESPONSE:

Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without hazard. Use water spray to disperse vapors and dilute standing pools of liquid. ((C)AAR, 1986)

### 7) FIRST AID:

Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation. (EPA, 1986)

### 8) PROPERTIES:

Flash Point: >-0.4 Deg F unspecified Greater than -18C (EPA, 1986)

Lower Exp Limit: 3 % (EPA, 1986)

Upper Exp Limit: 100 % (EPA, 1986)

Auto Igtn Temp: 804 Deg F (USCG, 1985)

Melting Point: -170.5 Deg F (EPA, 1986)

Vapor Pressure: 1095 mm Hg @ 68 Deg F (EPA, 1986)

Vapor Density: 1.49 (EPA, 1986)

Specific Gravity, Liquid: 0.8222 @ 50 Deg F (EPA, 1986)

Specific Gravity, Solid:

Boiling Point: 51.3 Deg F (EPA, 1986)

Molecular Weight: 44.06 (EPA, 1986)

IDLH: Not applicable, potential human carcinogen. (NIOSH, 1987)

TLV TWA: 1 ppm ((C)ACGIH, 1986)

TLV STEL:

## RESPONSE INFORMATION DATA SHEET, VERSION 2.0

NOAA - 7600 SAND POINT WAY N.E. SEATTLE, WA 98115 (206) 526-6317

CAS Number 74986/106978/68476857

LIQUEFIED PETROLEUM GAS

NFPA Degrees of Hazard

Health:

Flammability:

Reactivity:

Special:

## 1) GENERAL DESCRIPTION:

Liquefied petroleum gas is a colorless gas with a faint petroleum like odor shipped as a liquid under its vapor pressure. For transportation it may be stenciled. Contact with the liquid can cause frostbite. It is easily ignited. Its vapor is heavier than air and a flame can flash back to the source of leak very easily. This leak may be either a liquid or vapor leak. It can asphyxiate by the displacement of air. Under fire conditions the cylinders can rupture and rocket. ((C)AAR, 1986)

## 2) FIRE HAZARDS:

FLAMMABLE. Flashback along vapor trail may occur. Containers may explode in fire. Vapor may explode if ignited in an enclosed area. Containers may explode in fire. Vapor heavier than air and may travel a long distance to a source of ignition and flash back. (USCG, 1985)

## 3) FIRE FIGHTING:

Do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. ((C)AAR, 1986)

## 4) PROTECTIVE CLOTHING:

Avoid breathing vapors. Keep upwind. Wear protective gloves and goggles. Do not handle broken packages without protective equipment. Approach fire with caution. ((C)AAR, 1986)

Butyl: Poor Resistance/Good Data.

Chlorobutyl:

Chlor Rub:

CPE: Good Resistance/Good Data.

CR 39:

EVA PE:

FEP TFE:

Hypalon:

NBR:

Neoprene:

Neo Rub:

Neoprene SBR:

Nitrile: Good Resistance/Good Data.

Nitrile PVC:

PE: Poor Resistance/Good Data.

Polycarb:

PU: Good Resistance/Good Data.

PVA:

PVC: Poor Resistance/Good Data.

Rubber: Poor Resistance/Good Data.

Rub Neo NBR:

Rub Neo SBR:

Saranex:

SBR: Poor Resistance/Good Data.

Viton: Good Resistance/Good Data.

Viton Neo:

## HAZARDOUS MATERIALS COMMAND 2B

RESPONSE INFORMATION DATA SHEET, VERSION 2.0  
NOAA - 7600 SAND POINT WAY N.E. SEATTLE, WA 98115 (206) 526-6317

CAS Number 74986/106978/68476857 LIQUEFIED PETROLEUM GAS

### 5) HEALTH HAZARDS:

VAPOR: Not irritating to eyes, nose and throat. If inhaled, will cause dizziness, difficult breathing, or loss of consciousness. LIQUID: Will cause frostbite. (USCG, 1985)

### 6) NON-FIRE RESPONSE:

Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Attempt to stop leak if without hazard. Use water spray to knock-down vapors. ((C)AAR, 1986)

### 7) FIRST AID:

If this chemical comes in contact with the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical. If this chemical comes in contact with the skin, immediately flush the contaminated skin with water. If this chemical penetrates the clothing, immediately remove the clothing and flush the skin with water. Get medical attention promptly. If a person breathes in large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible. (NIOSH, 1987)

### 8) PROPERTIES:

Flash Point: -76 to -156 Deg F c.c. (USCG, 1985)  
Lower Exp Limit: 2.2 % For propane; 1,8 for butane. (USCG, 1985)  
Upper Exp Limit: 9.5 % For propane; 8.4 for butane. (USCG, 1985)  
Auto Igtn Temp: 761 to 871 Deg F (USCG, 1985)  
Melting Point: Not Applicable. (USCG, 1985)  
Vapor Pressure: 1313.56 mm Hg @ -20 Deg F (USCG, 1985)  
Vapor Density: 1.5 (USCG, 1985)  
Specific Gravity, Liquid: 0.51 to 0.58 @ -58 Deg F (USCG, 1985)  
Specific Gravity, Solid:  
Boiling Point: >-40 Deg F @ 760 mm Hg (USCG, 1985)  
Molecular Weight: >44 (USCG, 1985)  
IDLH: 19000 ppm (NIOSH, 1987)  
TLV TWA: 1000 ppm ((C)ACGIH, 1986)  
TLV STEL: 1250 ppm ((C)ACGIH, 1986)



RESPONSE INFORMATION DATA SHEET, VERSION 2.0  
NOAA - 7600 SAND POINT WAY N.E. SEATTLE, WA 98115 (206) 526-6317

CAS Number 7697372 NITRIC ACID, > 40%  
NFPA Degrees of Hazard  
Health: 3  
Flammability: 0  
Reactivity: 0  
Special: Oxidizer

1) GENERAL DESCRIPTION:

Nitric acid is colorless to pale yellow liquid with a suffocating odor. It is used to make other chemicals, as a reagent in chemical analysis, for ore flotation, and for many other uses. Is soluble in water with release of heat. It is noncombustible but it will accelerate the burning of combustible materials and can cause ignition by contact with combustible materials. It is corrosive to metals and tissue. ((C)AAR, 1986)

2) FIRE HAZARDS:

May ignite other combustible materials. Reactions with fuels may be violent. Runoff to sewer may create fire or explosion hazard. Noncombustible but dangerously reactive with many materials. Reacts explosively with metallic powders, carbides, hydrogen sulfide, and turpentine. Increases the flammability of combustible organic and readily oxidized materials. Can cause ignition of some of these materials. Avoid contact with moisture and heat. Reacts violently with alcohol, turpentine, charcoal, and organic refuse. Powerful reducing agents may cause explosion. Will react with water or steam to produce heat, and toxic and corrosive fumes. When heated to decomposition, it emits nitrogen oxides and hydrogen nitrate. (EPA, 1986)

3) FIRE FIGHTING:

Use water spray. Small fires: Water, dry chemical, or soda ash. Large fires: Flood fire area with water. Move container from fire area if you can do so without risk. Spray cooling water on containers that are exposed to flames until well after fire is out. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. (EPA, 1986)

4) PROTECTIVE CLOTHING:

Wear positive pressure breathing apparatus and special protective clothing. (EPA, 1986)

Butyl:  
Chlorobutyl:  
Chlor Rub:  
CPE:  
CR 39:  
EVA PE:  
FEP TFE:  
Hypalon:  
NBR:  
Neoprene: Good Resistance/Limited Data.  
Neo Rub:  
Neoprene SBR:  
Nitrile: Good Resistance/Limited Data.  
Nitrile PVC: Good Resistance/Limited Data.  
PE: Poor Resistance/Limited Data.  
Polycarb:  
PU:  
PVA: Poor Resistance/Limited Data.  
PVC: Good Resistance/Limited Data.  
Rubber: Good Resistance/Limited Data.  
Rub Neo NBR:  
Rub Neo SBR:

## HAZARDOUS MATERIALS COMMAND 2B

RESPONSE INFORMATION DATA SHEET, VERSION 2.0  
NOAA - 7600 SAND POINT WAY N.E. SEATTLE, WA 98115 (206) 526-6317

CAS Number 7697372 NITRIC ACID, > 40%  
Saranex: Good Resistance/Limited Data.  
SBR:  
Viton: Good Resistance/Limited Data.  
Viton Neo:

### 5) HEALTH HAZARDS:

This compound is a primary irritant, and causes burns and ulceration of all tissues and membranes that it contacts. This includes burns to the eyes and skin by contact, burns to the mouth, throat, esophagus, and stomach by ingestion, and the entire respiratory tract by inhalation. Circulatory collapse and shock is often the immediate cause of death. The approximate minimum lethal dose is 5 ml for a 150-lb person. Signs and Symptoms of Exposure: This compound causes burns and ulceration of all tissues to which it comes into contact. Ingestion causes burns, stomach pain, nausea and vomiting. After a few hours or a few days ruptured gut may occur. Shock with clammy skin, weak and rapid pulse, shallow respiration and scanty urine may occur. Inhalation can lead to bronchitis, respiratory tract irritation and pneumonia. Medical Conditions Generally Aggravated by Exposure: Persons with skin, eye or cardiopulmonary disorders are at a greater risk. (EPA, 1986)

### 6) NON-FIRE RESPONSE:

Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Use water spray to knock-down vapors. Neutralize spilled material with crushed limestone, soda ash, or lime. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash or cement powder. Neutralize with agricultural lime (slaked lime), crushed limestone, or sodium bicarbonate. Water spill: Neutralize with agricultural lime (slaked lime), crushed limestone, or sodium bicarbonate. Air spill: Apply water spray or mist to knock down vapors. Vapor knockdown water is corrosive or toxic and should be diked for containment. ((C)AAR, 1986)

### 7) FIRST AID:

If ingested, do not induce vomiting or give bicarbonate to neutralize. Irrigate the mouth and throat with large amounts of water and dilute the stomach contents by having the victim drink 1-2 large glasses of water or milk. If contacted, wash the skin or eyes with tap water for at least 15 minutes. Following inhalation, remove the victim to fresh air and monitor the patient for respiratory distress. Administer humidified 100 percent oxygen for 30 minutes out of every hour if necessary. (EPA, 1986)

### 8) PROPERTIES:

Flash Point: Not Applicable. Not flammable. (USCG, 1985)  
Lower Exp Limit: Not Applicable. Not flammable. (USCG, 1985)  
Upper Exp Limit: Not Applicable. Not flammable. (USCG, 1985)  
Auto Ign Temp: Not Applicable. Not flammable. (USCG, 1985)  
Melting Point: -44 Deg F (EPA, 1986)  
Vapor Pressure: 47.8 mm Hg @ 68 Deg F (EPA, 1986)  
Vapor Density: Not Applicable. (USCG, 1985)  
Specific Gravity, Liquid: 1.5027 @ 77 Deg F 1.4134 at 77 Deg F for 70% nitric acid (EPA, 1986)  
Specific Gravity, Solid:  
Boiling Point: 181 Deg F 248.9F for constant boiling acid at 68% nitric acid. (EPA, 1986)  
Molecular Weight: 63.01 (EPA, 1986)  
IDLH: 100 ppm For fuming nitric acid. (NIOSH, 1987)  
TLV TWA: 2 ppm For fuming nitric acid. ((C)ACGIH, 1986)  
TLV STEL: 4 ppm For fuming nitric acid. ((C)ACGIH, 1986)

## RESPONSE INFORMATION DATA SHEET, VERSION 2.0

NOAA - 7600 SAND POINT WAY N.E. SEATTLE, WA 98115 (206) 526-6317

CAS Number 8014957 OLEUM

NFPA Degrees of Hazard

Health: 3

Flammability: 0

Reactivity: 2

Special: No water

## 1) GENERAL DESCRIPTION:

Oleum is a colorless to black fuming liquid. It is used in the manufacture of chemicals, dyes, explosives and in petroleum refining. It is soluble in water with release of heat. It is corrosive to metals and tissue. It will char wood and most other organic matter. The heat from this charring may be sufficient to ignite the wood or organic matter. ((C)AAR, 1986)

## 2) FIRE HAZARDS:

Not flammable. May cause fire on contact with combustibles. Flammable gas may be produced on contact with metals. Toxic and irritating vapors are generated. (USCG, 1985)

## 3) FIRE FIGHTING:

Extinguish fire using agent suitable for type of surrounding fire (material itself does not burn or burns with difficulty). Use water in flooding quantities as fog. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. ((C)AAR, 1986)

## 4) PROTECTIVE CLOTHING:

Avoid breathing vapors. Keep upwind. Avoid bodily contact with the material. Wear boots, protective gloves, and goggles. Do not handle broken packages without protective equipment. Wash away any material which may have contacted the body with copious amounts of water or soap and water. If contact with the material anticipated, wear full protective clothing. ((C)AAR, 1986)

Butyl:

Chlorobutyl:

Chlor Rub:

CPE: Good Resistance/Good Data.

CR 39:

EVA PE:

FEP TFE:

Hypalon:

NBR:

Neoprene: Good Resistance/Good Data.

Neo Rub:

Neoprene SBR:

Nitrile: Good Resistance/Good Data.

Nitrile PVC:

PE:

Polycarb:

PU: Poor Resistance/Good Data.

PVA: Poor Resistance/Good Data.

PVC:

Rubber: Good Resistance/Limited Data.

Rub Neo NBR:

Rub Neo SBR:

Saranex:

SBR:

Viton: Good Resistance/Limited Data.

## HAZARDOUS MATERIALS COMMAND 2B

RESPONSE INFORMATION DATA SHEET, VERSION 2.0

NOAA - 7600 SAND POINT WAY N.E. SEATTLE, WA 98115 (206) 526-6317

CAS Number 8014957

OLEUM

Viton Neo:

### 5) HEALTH HAZARDS:

MIST: Irritating to eyes, nose and throat. If inhaled, will cause coughing or difficult breathing. LIQUID: Will burn skin and eyes. Harmful if swallowed. (USCG, 1985)

### 6) NON-FIRE RESPONSE:

Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Use water spray to knock-down vapors. Neutralize spilled material with crushed limestone, soda ash, or lime. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash or cement powder. Neutralize with agricultural lime (slaked lime), crushed limestone, or sodium bicarbonate. Water spill: Neutralize with agricultural lime (slaked lime), crushed limestone, or sodium bicarbonate. Air spill: Apply water spray or mist to knock down vapors. Vapor knockdown water is corrosive or toxic and should be diked for containment. ((C)AAR, 1986)

### 7) FIRST AID:

INGESTION: have victim drink water or milk; do NOT induce vomiting. EYES: flush with plenty of water for at least 15 minutes; call a doctor. SKIN: flush with plenty of water. (USCG, 1985)

### 8) PROPERTIES:

Flash Point: Not Applicable. Not flammable. (USCG, 1985)

Lower Exp Limit: Not Applicable. Not flammable. (USCG, 1985)

Upper Exp Limit: Not Applicable. Not flammable. (USCG, 1985)

Auto Ign Temp: Not Applicable. Not flammable. (USCG, 1985)

Melting Point: Not Applicable. (USCG, 1985)

Vapor Pressure: Not Applicable. (USCG, 1985)

Vapor Density: Not Applicable. (USCG, 1985)

Specific Gravity, Liquid: 1.91 to 1.97 @ 59 Deg F (USCG, 1985)

Specific Gravity, Solid:

Boiling Point: Decomposes. (USCG, 1985)

Molecular Weight:

IDLH:

TLV TWA:

TLV STEL:

# Appendix B

## Reference Source Examples

## NFPA FIRE PROTECTION GUIDE ON HAZARDOUS MATERIALS

### NFPA 49 Hazardous Chemicals Data

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#### ETHYLENE OXIDE $\text{CH}_2\text{OCH}_2$

**DESCRIPTION:** Colorless gas at ordinary temperatures; liquid below 51° F; has an ether-like odor.

**FIRE & EXPLOSION HAZARDS:** Flammable liquid with boiling point of 51° F. Vapor forms explosive mixtures with air over wide range. Flammable limits, 3% and 100%. Flash point, less than 0° F. Ignition temperature in air, 804° F.; ignition temperature of 100% ethylene oxide, 1,058° F. Liquid is lighter than water (specific gravity, 0.9). Vapor is heavier than air (vapor density, 1.5) and may travel considerable distance to a source of ignition and flash back. Dangerously reactive; may rearrange chemically and/or polymerize violently with evolution of heat, when in contact with highly active catalytic surfaces such as anhydrous chlorides of iron, tin and aluminum, pure oxides of iron and aluminum, and alkali metal hydroxides. Although soluble in water, solutions will continue to burn until diluted to approximately 22 volumes of water to one volume of ethylene oxide.

**LIFE HAZARD:** Moderately toxic by inhalation; eye, skin and respiratory irritant; prolonged contact with skin may result in delayed burns.

**PERSONAL PROTECTION:** Wear self-contained breathing apparatus.

**FIRE FIGHTING PHASES:** Fire fighting should be done from an explosion-resistant location. Use water from unmanned monitors or hoseholders to keep fire-exposed containers cool. If it is necessary to stop the flow of gas, use water spray to protect men effecting shut-off.

**USUAL SHIPPING CONTAINERS:** Steel cylinders, drums, insulated tank cars, tank barges.

**STORAGE:** Protect against physical damage. Should be kept cool, below 86° F. Should be stored outside, away from buildings and other materials, in insulated tanks or containers, shielded from sun-heat, provided with cooling facilities and protected by a properly designed water-spray system. Adequate diking and drainage should be provided in tank area to confine and dispose of liquid in case of tank rupture. Avoid pits and depressions. Inside storage should be held to a minimum and confined to a standard fire-resistive flammable liquids storage room, provided with continuous ventilation and free of sources of ignition. Do not permit chlorides, oxides, acids, organic bases, alkali metal hydroxides, metallic potassium or other combustible materials in storage room.

**REMARKS:** Electrical installations in Class I hazardous locations, as defined in Article 500 of the National Electrical Code, should be in accordance with Article 501 of the Code. If explosion-proof electrical equipment is necessary, it shall be suitable for use in group B, except that Group C equipment may be used if such equipment is isolated in accordance with Section 501-5(a) by sealing all conduit 1/2-inch size or larger. See Flammable and Combustible Liquids Code (NFPA No. 30), National Electrical Code (NFPA No. 70), Static Electricity (NFPA No. 77), Lightning Protection Code (NFPA No. 78) and Fire-Hazard Properties of Flammable Liquids, Gases and Volatile Solids (NFPA No. 325M).

# EMERGENCY HANDLING OF HAZARDOUS MATERIALS IN SURFACE TRANSPORTATION

## Bureau of Explosives Association of American Railroads

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### ETHYLENE OXIDE FLAMMABLE LIQUID, CORROSIVE THERMALLY UNSTABLE

(STCC #)

4906610  
UN1040

Ethylene oxide is a clear, colorless volatile liquid with an ethereal odor. It is used to make other chemicals, as a fumigant and industrial sterilant. It has a flash point of less than 0° F, and is flammable over a wide vapor-air concentration range. The material has to be diluted on the order of 24 to 1 with water before the liquid loses its flammability. If contaminated, it may polymerize violently with evolution of heat and rupture of its container. The vapors may burn inside a container. The vapors are irritating to the eyes, skin, and respiratory system. Prolonged contact with the skin may result in delayed burns. It is lighter than water & soluble in water. The vapors are heavier than air.

#### If material on fire or involved in fire...

- Do not extinguish fire unless flow can be stopped.
- Use water in flooding quantities as fog.
- Solid streams of water may be ineffective.
- Cool all affected containers with flooding quantities of water.
- Apply water from as far a distance as possible.
- Use "alcohol" foam, carbon dioxide or dry chemical.

#### If material not on fire and not involved in fire...

- Keep sparks, flames, and other sources of ignition away.
- Keep material out of water sources and sewers.
- Build dikes to contain flow as necessary.
- Attempt to stop leak if without hazard.
- Use water spray to disperse vapors and dilute standing pools of liquid.

#### Personnel protection...

- Avoid breathing vapors
- Keep upwind.
- Wear self-contained breathing apparatus.
- Avoid bodily contact with the material.
- Wear full protective clothing.
- Do not handle broken packages without protective equipment
- Wash away any material which may have contacted the body with copious amounts of water or soap and water.

#### Evacuation...

- If fire is prolonged and material is confined in the container—evacuate for a radius of 5000 feet.
- If fire becomes uncontrollable or container is exposed to direct flame—evacuate for a radius of 5000 feet.

## NIOSH POCKET GUIDE TO CHEMICAL HAZARDS

|                                                                                            |                                                                                         |                                                                                                                    |                   |                                                                                                                                                                                    |                                                              |                                                                       |                                                                                                                                                    |                                     |
|--------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|-----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| Ethyleneoxide<br>C <sub>2</sub> H <sub>4</sub> O<br><br>75-21-8<br>K02450000<br><br>104060 | Dimethylenoxide;<br>1,2-Epoxyethane;<br>Oxirane                                         | 1ppm<br>(1.8mg/m3)<br>(NIOSH)<br><0.1ppm, 8-hr<br>TWA<br>5ppm, 10-min cell<br>See Appendix A<br>(ACGIH)<br>1ppm/A2 | 800ppm<br><br>Ca  | Colorless liquid or gas<br>with an ether-like odor,<br>irritating at high<br>concentrations                                                                                        | MM#4<br>BP:51°F<br>Sol: Miscible<br>FLP: 40°F<br>IP: 10.56eV | VP: 1095<br>mm<br>MP: 171°F<br>UEL: 100%<br>LEL: 3%                   | Even small amounts of strong<br>acids, alkalis, oxidizers; catalytic<br>anhydrous chlorides of iron,<br>aluminum, tin; oxides of iron;<br>aluminum | Char;<br>CS <sub>2</sub><br>CC<br>T |
| Clothing:<br>Goggles:<br>Wash:<br>Change:<br>Remove:<br>Provide:                           | Any poss<br>Reason prob<br>Immed upon contam<br>NA<br>Any wet Immed (flamm)<br>Eye wash | NIOSH<br>E: SCBA/F/DP/PP/<br>SAFF/DP/ASOBA<br>Escape: GMF/SSCBAE                                                   | Inh<br>Ing<br>Con | Irr: eyes, nose, throat;<br>peculiar taste; head; nau;<br>vom; diarr; dysp; cyan;<br>pulm edema; drow; weak;<br>inco; EKG abnormalities;<br>burns eyes, skin; frostbite;<br>[carc] | Eye:<br>Skin:<br>Breath:<br>Swallow:                         | Irr Immed<br>Water flush Immed<br>Art resp<br>Medical attention Immed | Eyes, blood, resp sys,<br>liver, CNS, kidneys                                                                                                      |                                     |

**Table 4  
ABBREVIATIONS FOR SYMPTOMS OF EXPOSURE**

|                |                                              |                    |                                                                         |
|----------------|----------------------------------------------|--------------------|-------------------------------------------------------------------------|
| abdom .....    | abdominal                                    | carc .....         | carcinogenic/carcinogen                                                 |
| album .....    | albuminuria                                  | card .....         | cardiac                                                                 |
| anem .....     | anemia                                       | cere .....         | cerebral                                                                |
| anes .....     | anesthesia                                   | chol .....         | cholinesterase                                                          |
| anor .....     | anorexia                                     | chor .....         | chorea                                                                  |
| anos .....     | anosmia                                      | cirr .....         | cirrhosis                                                               |
| ANS .....      | autonomic nervous system                     | CNS .....          | central nervous system                                                  |
| apat .....     | apathy                                       | coll .....         | collapse                                                                |
| appre .....    | apprehension                                 | conf .....         | confusion                                                               |
| arrhy .....    | arrhythmias                                  | conj .....         | conjunctivitis                                                          |
| asphy .....    | asphyxia                                     | constip .....      | constipation                                                            |
| asth .....     | asthma                                       | constric .....     | constriction                                                            |
| atax .....     | ataxia                                       | convuls .....      | convulsions                                                             |
| biliru .....   | bilirubinuria                                | cor pul-<br>monale | acute right heart strain or<br>chronic right ventricular<br>hypertrophy |
| blur .....     | blurred                                      | corn .....         | cornea                                                                  |
| breath .....   | breathing                                    | CVS .....          | cardiovascular system                                                   |
| bron .....     | bronchitis                                   | cyan .....         | cyanosis                                                                |
| bronspas ..... | broncospasm                                  | defat .....        | defatting                                                               |
| BUN .....      | blood urea nitrogen                          |                    |                                                                         |
| ca .....       | cancer                                       |                    |                                                                         |
| cachexia ..... | severe generalized weak-<br>ness, emaciation |                    |                                                                         |







# Appendix C

## Hazardous Materials Plans

There are several plans that are important to First Responders, some of the most important are; the Local Area Plan, the California Hazardous Material Incident Contingency Plan and The National Contingency Plan. All of these plans are designed to aid the First Responder by having guidelines already in place before an emergency occurs. These plans show the First Responder what initial actions should be taken, what the lines of authority are, what State Government has planned and what the Federal Government has planned.

## Generic Local Area Plan

### Introduction

The purpose of this plan is to meet the requirements of California Administrative Code, Title 19, Article 3 as they relate to implementing the requirements of Chapter 6.95 of the Health and Safety Code. This plan identifies procedures to be used to coordinate the management of hazardous materials. Roles and responsibilities will be established for government agency actions which are required to protect life, the environment and property from the effects of any hazardous material release or threatened release.

Some of the objectives of this plan are:

1. To provide guidance to those required to provide service in the event of a hazardous materials incident.
2. To describe pre-emergency preparation, concept of operations, organization, incident scene management system, protective actions, and supporting systems required to implement this plan.
3. To define responsibilities and functions of each participating organization, public or private.
4. To establish lines of authority and coordination.

This area plan will be reviewed and, if necessary, revised on an annual basis by the County and cities effected to ensure adequate coordination of responses to releases or threatened releases of hazardous materials.

Every business which manufactures, transports or uses hazardous material will develop a Risk Management Prevention Plan as pursuant to Chapter 6.95 of the Health and Safety Code.

This plan will establish the concept of emergency operations, including identification of agencies involved in response, lines of authority in multijurisdictional efforts, coordination among such agencies during activation of this plan, and integration of mandated business contingency plans as background for this plan's development.

### **Procedures and Protocols for Emergency Rescue Personnel**

The names, and communication identities of the Environmental Health staff designated as members of the hazardous material emergency response team, will be filed, and periodically updated with the County Department of Communication. In addition to Environmental Health staff the response team will include specially trained members of the Fire Service. The Environmental Health staff, and upon request, the Fire Department Hazardous Material Team will respond to hazardous material spills throughout the County.

In the event of a hazardous material incident the First Responder will notify, 9-1-1 and request notification of the County Hazardous Material Specialist, if warranted.

The County Hazardous Material Specialist will be notified by pager of the incident. The Division of Environmental Health has Hazardous Material Specialists, one of whom is on call 24 hours a day 7 days a week. The County Hazardous Material Specialist will communicate with the Incident Commander, acknowledge the notification, and will seek more information if needed.

The designation of Incident Commander will be dependent on where the hazardous material incident has occurred.

1. When incidents occur on freeways, the Incident Commander will be the responsibility of the California Highway Patrol supported by Caltrans. The County's Hazardous Response Team will work with the Incident Commander acting in a capacity of technical support.
2. When the hazardous material incident occurs within on of the incorporated cities, the Incident Commander will normally be the City Police Department. In some cities this authority has been transferred to the City Fire Department.

3. If the hazardous material incident occurs in the unincorporated area of the County, the Incident Commander will be the Highway Patrol if the incident is on or adjacent to a State Highway. If the hazardous material incident occurs on a County road in the unincorporated area of the County the Incident Commander will be the California Highway Patrol.
4. If the hazardous material incident occurs in the unincorporated area of the county on private property, the Incident Commander will be the County Sheriff's Department.

Upon arrival at the scene of the incident, the County Hazardous Material Specialist, and all responding agencies will report to the Incident Commander for information and assessment of the situation and establish a coordinated role with other responders.

## **The California Hazardous Material Incident Contingency Plan**

The purpose of the California Hazardous Material Incident Contingency Plan (HMICP or Plan) is to establish the emergency response organization for hazardous material incident occurring within the State of California. The HMICP is established to help state employees and agencies to respond appropriately to hazardous material incident. The Plan is established pursuant to Sections 8574.16-8574.17 of the California Government Code and fulfills the requirement for a state toxic disaster plan.

## **The National Contingency Plan**

The National Contingency Plan (NCP) is found in 40 CFR Part 300. The NCP specifies the Federal On-Scene Coordinator for incidents in Coastal Areas as the Coast Guard, and for Inland Areas as the EPA. For major pollution incidents, either agency may activate the federal response system described in the National Contingency Plan. Federal agencies can be accessed during a hazardous material emergency by calling the National Response Center at 1-800-424-8802.

## **Federal requirement for Hazmat action plan**

The safety and security of response personnel and others in the area of an emergency response incident site should be of primary concern to the incident commander. The use of a site safety and control plan could greatly assist those in charge of assuring the safety and health of employees on the site.

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## HAZARDOUS MATERIALS ON-SCENE INCIDENT COMMANDER

A comprehensive site safety and control plan, also known as an action plan, should include the following: summary analysis of hazards on the site and a risk analysis of those hazards; site map or sketch; site work zones (clean zone, transition or decontamination zone, work or hot zone); use of the buddy system; site communications; command post or command center; standard operating procedures and safe work practices; medical assistance and triage area; hazard monitoring plan (air contaminate monitoring, etc.); decontamination procedures and area; and other relevant areas. One of the most important things that this plan must include is what will be the outcome of natural stabilization. This plan should be a part of the employer's emergency response plan or an extension of it to the specific site.

### Summary

Students must know the management system and organization that is in your local jurisdiction's hazardous materials plan. With the information available in local plans make operational checklists and position descriptions to follow the plan.





# Appendix D

## Material Safety Data Sheets

**HAZARDOUS MATERIALS ON-SCENE  
INCIDENT COMMANDER**

|                                                                                                                                                                                                                                                                             |                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>U.S. DEPARTMENT OF LABOR</b><br><b>Occupational Safety and Health Administration</b><br><br><b>MATERIAL SAFETY DATA SHEET</b><br><br><b>Required under USDL Safety and Health Regulations for Ship<br/>Repairing, Shipbuilding, and Shipbreaking (29 CFR 1915, 1916,</b> | Form Approved<br>OMB No. 44- |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|

| <b>SECTION I</b>                                                                  |                                                             |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------|
| MANUFACTURER'S NAME<br>Mallinckrodt, Inc.                                         | EMERGENCY TELEPHONE NO.<br>606-987-7000                     |
| ADDRESS (Number, Street, City, State, and ZIP Code)<br>P.O. Box M Paris, KY 40361 |                                                             |
| CHEMICAL NAME AND SYNONYMS<br>Isopropyl Alcohol                                   | TRADE NAME AND SYNONYMS<br>2-Propanol    Sec_Propyl Alcohol |
| CHEMICAL FAMILY<br>Organic Alcohol                                                | FORMULA<br>(CH <sub>3</sub> ) <sub>2</sub> CHOH             |

| <b>SECTION II - HAZARDOUS INGREDIENTS</b>                    |   |                |                                           |   |                |
|--------------------------------------------------------------|---|----------------|-------------------------------------------|---|----------------|
| PAINTS, PRESERVATIVES, & SOLVENTS                            | % | TLV<br>(Units) | ALLOYS AND METALLIC COATINGS              | % | TLV<br>(Units) |
| PIGMENTS                                                     |   |                | BASE METAL                                |   |                |
| CATALYST                                                     |   |                | ALLOYS                                    |   |                |
| VEHICLE                                                      |   |                | METALLIC COATINGS                         |   |                |
| SOLVENTS                                                     |   |                | FILLER METAL<br>PLUS COATING OR CORE FLUX |   |                |
| ADDITIVES                                                    |   |                | OTHERS                                    |   |                |
| OTHERS                                                       |   |                |                                           |   |                |
| <b>HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES</b> |   |                |                                           | % | TLV<br>(Units) |
|                                                              |   |                |                                           |   |                |
|                                                              |   |                |                                           |   |                |
|                                                              |   |                |                                           |   |                |
|                                                              |   |                |                                           |   |                |

| <b>SECTION III - PHYSICAL DATA</b>                                    |         |                                       |      |
|-----------------------------------------------------------------------|---------|---------------------------------------|------|
| BOILING POINT (F.)                                                    | 176-189 | SPECIFIC GRAVITY (H <sub>2</sub> O=1) | 0.79 |
| VAPOR PRESSURE (mm Hg.)                                               | F       | PERCENT, VOLATILE<br>BY VOLUME (%)    |      |
| VAPOR DENSITY (AIR=1)                                                 | 2.07    | EVAPORATION RATE<br>(<br>= 1)         |      |
| SOLUBILITY IN WATER                                                   |         | Mol. Wt.                              | 6009 |
| APPEARANCE AND ODOR      Clear, colorless liquid. Characteristic odor |         |                                       |      |

| <b>SECTION IV - FIRE AND EXPLOSION HAZARD DATA</b>                                                                                                                                                                                                               |                  |                         |                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------------------|--------------------------|
| FLASH POINT (Method used)                                                                                                                                                                                                                                        | FLAMMABLE LIMITS | L <sub>EL</sub><br>2.3% | U <sub>EL</sub><br>12.7% |
| EXTINGUISHING MEDIA                                                                                                                                                                                                                                              |                  |                         |                          |
| SPECIAL FIRE FIGHTING PROCEDURES<br>Use water to keep fire-exposed containers cool, to disperse vapors, to flush spills to non-flammable mixtures                                                                                                                |                  |                         |                          |
| UNUSUAL FIRE AND EXPLOSION<br>HAZARDS    Vapors may travel long distances to ignition source and flash back. Dangerous fire hazard when exposed to heat, flame, or oxidizers. Moderate Explosion Hazard when exposed to heat or flame. Refer also to Section VI. |                  |                         |                          |

**SECTION V - HEALTH HAZARDS DATA****THRESHOLD LIMIT VALUE**

TWA 400 ppm: Toxicity: Oral (Rat) Ld50: 5.84 g/Kg: None available, Dermal (Rabbit) LD 50 16K/KG.

**EFFECTS OF OVEREXPOSURE**

Inhalation: Irritation of respiratory tract, headache, nausea, and at high concentrations, narcosis. Ingestion: Headache, dizziness, nausea. Local: Irritation of skin, eyes, nose

**EMERGENCY AND FIRST AID PROCEDURES**

Inhalation: Give artificial respiration if victim is breathing and call doctor.

Ingestion: Call doctor; if victim is conscious, give water and induce vomiting.

Eye Contact: Wash and water at least 15 min. and call doctor, Skin Contact: Wash well with water.

**SECTION VI - REACTIVITY DATA**

|                                                                                                                                               |                |   |                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------|---|---------------------|
| STABILITY                                                                                                                                     | UNSTABLE       |   | CONDITIONS TO AVOID |
|                                                                                                                                               | STABLE         | X | Heat and open flame |
| INCOMPATIBILITY (Materials to avoid) Oxidizing materials; (H <sub>2</sub> + Pd), nitroform, oleum, COCl <sub>2</sub> , potassium-tertbutoxide |                |   |                     |
| HAZARDOUS DECOMPOSITION PRODUCTS                                                                                                              |                |   |                     |
| HAZARDOUS POLYMERIZATION                                                                                                                      | MAY OCCUR      |   | CONDITIONS TO AVOID |
|                                                                                                                                               | WILL NOT OCCUR | X |                     |

**SECTION VII - SPILL OR LEAK PROCEDURES****STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED**

Eliminate all sources of ignition. Provide ventilation and flush to sewer with copious amounts of water.

**WASTE DISPOSAL METHOD**

(1) Atomize into an incinerator (2) Dilute with water and flush small amounts of sewer.

**SECTION VIII - SPECIAL PROTECTION INFORMATION**

|                                                          |                             |                                                     |         |
|----------------------------------------------------------|-----------------------------|-----------------------------------------------------|---------|
| RESPIRATORY PROTECTION <i>(Specify type)</i>             |                             |                                                     |         |
| Mask with organic vapor canister                         |                             |                                                     |         |
| VENTILATION                                              | LOCAL EXHAUST               | May be advisable.                                   | SPECIAL |
|                                                          | MECHANICAL <i>(General)</i> |                                                     | OTHER   |
| PROTECTIVE GLOVES Rubber                                 |                             | EYE PROTECTION Splash proof goggles or face shield. |         |
| OTHER PROTECTIVE EQUIPMENT Lab coat, apron or coveralls. |                             |                                                     |         |

**SECTION IX -SPECIAL PRECAUTIONS****PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING**

Store in area for flammable solvents free of ignition sources. Protect from physical damage. Should not be stored with oxidizing materials.

**OTHER PRECAUTIONS**

## Glossary of Common MSDS Terms

Excerpt from the *MSDS User's Guide*, courtesy of Shell Oil Company. Single copies of the Guide may be obtained from: Shell Oil Company, H.S. & E. Information Services Library, P.O. Box 4320, Houston, TX 77210-4320, (713) 241-1510.

— A —

**Acute Effect** - An adverse effect on a human or animal body, with severe symptoms developing rapidly and coming quickly to a crisis. Also see "chronic."

**Acute Toxicity** -The adverse (acute) effects resulting from a single dose or exposure to a substance. Ordinarily used to denote effects in experimental animals.

**ACGIH** - American Conference of Governmental Industrial Hygienists; an organization of professional personnel in governmental agencies or educational institutions engaged in occupational safety and health programs. ACGIH develops and publishes recommended occupational exposure limits (see "TLV") for hundreds of chemical substances and physical agents.

**ANSI** - American National Standards Institute; a privately-funded, voluntary membership organization that identifies industrial and public needs for national consensus standards and coordinates development of such standards. Many ANSI standards relate to safe design/performance of equipment — such as safety shoes, eyeglasses, smoke detectors, fire water pumps, household appliances — and safe practices or procedures — such as noise measurement, testing of fire extinguishers and flame arrestors, industrial lighting practices, and use of abrasive wheels.

**API** - American Petroleum Institute; voluntary membership organization of the petroleum industry. Among its services, API assists member committees in developing — by the consensus process — and publishing recommended practices for drilling and well servicing, storage tank installation, tank cleaning, piping and fittings, and other industry-related design, installation, and operating practices. API also funds and publishes basic reference books and manuals (e.g., "Industrial Hygiene Monitoring Manual for Petroleum Refineries and Selected Petrochemical Operations").

**Asphyxiant** - A vapor or gas which can cause unconsciousness or death by suffocation (lack of oxygen). Most simple asphyxiants are harmful to the body only when they become so concentrated that they reduce oxygen in the air (normally about 21 percent) to dangerous levels (18 percent or lower). Asphyxiation is one of the principal potential hazards of working in confined and enclosed spaces.

**ASTM** - American Society for Testing and Materials; voluntary membership organization with members from a broad spectrum of individuals, agencies, and industries concerned with materials. The world's largest source of voluntary consensus standards for materials, products, systems, and services, ASTM is a resource for sampling and testing methods, health and safety aspects of materials, safe performance guidelines, and effects of physical and biological agents and chemicals.

— B —

**Boiling Point** - The temperature at which a liquid changes to a vapor state, at a given pressure; usually expressed in degrees Fahrenheit at sea level pressure (760mm Hg, or one atmosphere). For mixtures, the initial boiling point or the **boiling range** may be given. Flammable materials with low boiling points generally present special fire hazards. Some approximate boiling points:

|                   |       |                 |       |
|-------------------|-------|-----------------|-------|
| Propane           | -44°F | Gasoline        | 100°F |
| Anhydrous Ammonia | -28°F | Allyl Chloride  | 113°F |
| Butane            | 31°F  | Ethylene Glycol | 387°F |

**BOM, or BuMines** - Bureau of Mines of the U.S. Department of Interior. BuMines began approving air breathing apparatus in 1918, later added all types of respirators. BOM's respirator testing/approval activities have been discontinued; NIOSH now has this responsibility. Most BOM approvals have expired or been replaced by NIOSH approvals.

— C —

**C** - Celsius; a temperature scale, also known as centigrade.

**CAA** - Clean Air Act; federal law enacted to regulate/reduce air pollution. Administered by EPA

**Carcinogen** - A substance or agent capable of causing or producing cancer in mammals. The OSHA Hazard Communication Standard (see "Hazard Communication Standard") defines a carcinogen as a substance evaluated by the International Agency for Research on Cancer or by the National Toxicology Program in the Annual Report on Carcinogens and found to be a carcinogen or potential carcinogen, or is regulated by OSHA as a carcinogen.

**CAS** - Chemical Abstracts Service; a Columbus, Ohio organization affiliated with the American Chemical Society. CAS abstracts and indexes chemical literature from all over the world in "Chemical Abstracts." Information about particular substances may be located in the "Abstracts" when needed. "CAS Numbers" identify specific chemicals or mixtures.

## HAZARDOUS MATERIALS ON-SCENE INCIDENT COMMANDER

**cc** - Cubic centimeter; a volume measurement in the metric system, equal in capacity to one milliliter (ml). One quart is about 946 cubic centimeters.

**Ceiling** - The maximum allowable human exposure limit for an airborne substance; not to be exceeded even momentarily. Also see "PEL" and "TLV."

**CERCLA** - Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (Superfund); federal environmental legislation, administered by EPA, for regulating cleanup and liability for hazardous waste sites. Also establishes reporting requirements for releases of designated substances into the environment.

**Chemical Family** - A group of single elements or compounds with a common general name. Example: acetone, methyl ethyl ketone (MEK) and methyl isobutyl ketone (MIBK) are of the "ketone" family; acrolein, furfural, and acetaldehyde are of the "aldehyde" family.

**CHEMTREC** - Chemical Transportation Emergency Center; a national center established by the Chemical Manufacturers Association (CMA) in Washington, D.C., in 1970, to relay pertinent emergency information concerning specific chemicals on request. CHEMTREC has a 24-hour toll-free telephone number (800-424-9300), intended primarily for use by those who respond to chemical transportation emergencies.

**Chronic Effect** - An adverse effect on a human or animal body, with symptoms which develop slowly over a long period of time or which recur frequently. Also see "acute".

**Chronic Toxicity** - Adverse (chronic) effects resulting from repeated doses of or exposures to a substance over a relatively prolonged period of time. Ordinarily used to denote effects in experimental animals.

**CNS** - Central Nervous System. Early to moderate CNS depression may be evidenced by giddiness, headache, and nausea.

**CWA** - Clean Water Act; federal law enacted to regulate/reduce water pollution. Administered by EPA

**CO** - Carbon monoxide, a colorless, odorless, flammable, and very toxic gas produced by the incomplete combustion of carbon; also a by-product of many chemical processes.

**CO<sub>2</sub>** - Carbon dioxide will not burn and is relatively nontoxic (although high concentrations, especially in confined spaces, can create hazardous oxygen- deficient environments).

**COC** - Cleveland Open Cup; a flashpoint test method.

**Combustible** - A term used by NFPA DOT, OSHA, and others to classify certain liquids that will burn, on the basis of flashpoints. NFPA, OSHA and DOT generally define “combustible liquids” as having a flashpoint of 100°F (37.8°C) or higher. Also see “flammable.” Non-liquid substances such as wood and paper are classified as “ordinary combustibles” by NFPA.

**Concentration** - The relative amount of a substance when combines or mixed with other substances. Examples: 2 ppm hydrogen sulfide in air, or a 50 percent caustic solution.

**Corrosive** - As defined by DOT, a corrosive material is a liquid or solid that causes visible destruction of, or irreversible alterations in, human skin tissue at the site of contact or — in the case of leakage from its packaging — a liquid that has a severe corrosion rate on steel. A solid or liquid waste which exhibits a “characteristic of corrosivity,” as defined by RCRA may be regulated (by EPA) as a hazardous waste. As defined by OSHA corrosive does not refer to action on inanimate surfaces (e.g., steel).

**CPSC** - Consumer products Safety Commission; federal agency with responsibility for regulating hazardous materials when they appear in consumer goods. For CPSC purposes, hazards are defined in the Hazardous Substances Act and the Poison Prevention Packaging Act of 1970.

**Cutaneous Toxicity** - See “Dermal Toxicity.”

## —D—

**Decomposition** - Breakdown of a material or substance (by heat, chemical reaction, electrolysis, decay, or other processes) into parts or elements or simpler compounds.

**Dermal** - Used on or applied to the skin.

**Dermal Toxicity** - Adverse effects resulting from skin exposure to a substance. Ordinarily used to denote effects in experimental animals.

**DHHS** - U.S. Department of Health and Human Services; created in 1980 to replace the Department of Health, Education and Welfare as “parent” for NIOSH, the Public Health Service, and other agencies related to health and safety.

**DOL** - U.S. Department of Labor; includes OSHA (Occupational Safety and Health Administration) and MSHA (Mine Safety and Health Administration).

**DOT** - U.S. Department of Transportation; regulates transportation of chemicals and other substances, to aid in the protection of the public as well as fire, law enforcement, and other emergency response personnel, particularly when transportation incidents occur involving hazardous materials. Detailed DOT classification lists specify appropriate warnings — such as Oxidizing Agent or Flammable Liquid — which must be used for various substances. DOT requires labeling of hazardous materials in transit.

— E —

**EPA** - U.S. Environmental Protection Agency; federal agency with environmental protection regulatory and enforcement authority. Administers Clean Water Act, CAA FIFRA RCRA, TSCA CERCLA, and other federal environmental laws.

**Epidemiology** - The science that deals with the study of disease in a general population. Determination of the incidence (rate of occurrence) and distribution of a particular disease (as by age, sex, or occupation) may provide information about the cause of the disease.

**ERG** - North American Emergency Response Guide.

**Evaporation Rate** - The rate at which a material vaporizes (evaporates) compared to the rate of vaporization of a known material, usually normal- butyl acetate (NBUAC or nBuAc), with a rate designated as 1.0. Evaporation rate can be useful in evaluating health and fire hazards of a material. Vaporization rates of other materials are classified as:

- **FAST:** evaporating if greater than 3.0. E.g., Methyl Ethyl Ketone (MEK) = 3.8, Acetone = 5.6, Hexane = 8.3.
- **MEDIUM:** evaporating if 0.8 to 3.0. E.g., 190 proof (95%) Ethyl Alcohol = 1.4, VM&P Naphtha = 1.4, MIBK = 1.6.
- **SLOW:** evaporating if less than 0.8. E.g., Xylene = 0.6, Bis-Butyl Alcohol = 0.6, Butyl Alcohol = 0.4, Water = 0.3, Mineral Spirits = 0.1.



## — F —

**F** - Fahrenheit; a temperature scale.

**FDA** - The U.S. Food and Drug Administration; under the provisions of the Federal Food, Drug and Cosmetic Act, the FDA establishes requirements for the labeling of foods and drugs. FDA also regulates materials for food contact service and the conditions under which such materials are approved.

**FIFRA** - Federal Insecticide, Fungicide and Rodenticide Act; regulations administered by EPA under this Act require that certain useful poisons, such as chemical pesticides, sold to the public contain labels that carry health hazard warnings to protect users.

**Flammable** - A “flammable liquid” is defined by NFPA, OSHA, and DOT as a liquid with a flashpoint below 100°F (37.8°C). Solids that will ignite readily or are liable to cause fires under ordinary conditions of transportation through friction or retained heat from manufacturing or processing, and which burn so vigorously and persistently as to create a serious transportation hazard, are classified by DOT and OSHA as “flammable solids.” Also see “combustible.”

**Flammable Range** - The ratio of vapor to air in which range ignition can occur.

**Flashpoint** - The temperature at which a liquid will give off enough flammable vapor to ignite. There are several flashpoint test methods, so flashpoints may vary for the same material depending on the method used. The test method is indicated when the flashpoint is given (150° PMCC, 200° TCC, etc.).

**Formula** - The conventional scientific designation for a material (water is H<sub>2</sub>O, sulfuric acid is H<sub>2</sub>SO<sub>4</sub>, sulfur dioxide is SO<sub>2</sub>, etc.).

## — G —

**g** - gram; a metric unit of weight. One ounce U.S. (avoirdupois) is about 28.4 grams.

**g/kg** - grams per kilogram; an expression of dose used in oral and dermal toxicology testing to indicate the grams of substance dosed per kilogram of animal body weight. Also see “kg” (kilogram).

**General exhaust** - A system for exhausting air which contains contaminants from a general work area. Also see “local exhaust.”

— H —

**Hazard Communication Standard** - Federal standard administered by OSHA regulating transmittal to employees of information on substance hazards. The transmittal is to be by container labeling and other forms of warning, MSDS, and employee training. 29CFR1910.1200.

**Hazardous Chemical** - As defined in the OSHA Hazard Communication Standard, any chemical which is a physical hazard or a health hazard. Hazardous chemicals require certain specific action under the OSHA standard.

**Hazardous Material** - In a broad sense, a hazardous material is any substance or mixture of substances having properties capable of producing adverse effects on the health or safety of a human being. In 1971 OSHA adopted the following definition in regulations affecting employers in operations subject to the federal Longshoremen's and Harbor Workers' Compensation Act:

"The term hazardous material means a material which has one or more of the following characteristics:

- 1) Has a flashpoint below 140°F., closed cup, or is subject to spontaneous heating;
- 2) Has a threshold limit value below 500 ppm for gases and vapors, below 500 mg/m<sub>2</sub> for fumes, and below 25 mppcf for dusts;
- 3) A single-dose oral LD<sub>50</sub> below 500 mg/kg;
- 4) Is subject to polymerization with the release of large amounts of energy;
- 5) Is a strong oxidizing or reducing agent;
- 6) Causes first degree burns to skin in short time exposure, or is systemically toxic by skin contact; or
- 7) In the course of normal operations, may produce dusts, gases, fumes, vapors, mists, or smokes which have one or more of the above characteristics. "

— I —

**IDLH** - Immediately Dangerous to Life and Health, Any condition that poses an immediate threat to life, or produces acute or severe health effects (29 CFR 1910).

**Ignitable** - As defined by RCRA, a solid, liquid, or compressed gas waste which exhibits a "characteristic of ignitability" (having a flashpoint less than 140°F). It may be regulated (by EPA) as a hazardous waste.

**Ignition Temperature** - The minimum temperature of a liquid at which

it gives off vapors sufficient to form an ignitable mixture with air. (Requires ignition source for ignition to occur.)

**Incompatible** - Materials which could cause dangerous reactions from

direct contact with one another are described as incompatible.

**Ingestion** - The taking in of a substance through the mouth.

**Inhalation** - The breathing in of a substance in the form of a gas, vapor, fume, mist, or dust.

**Inhibitor** - A chemical which is added to another substance to prevent an unwanted chemical change from occurring.

**Internal Standard** - A Shell term for an exposure standard established by the company. See the explanation for Section IV of the MSDS.

**Irritant** - A substance which, by contact in sufficient concentration for a sufficient period of time, will cause an inflammatory response or reaction of the eye, skin, or respiratory system. The contact may be a single exposure or multiple exposures. Some primary irritants: chromic acid, nitric acid, sodium hydroxide, calcium chloride, amines, metallic salts, chlorinated hydrocarbons, ketones, alcohols. OSHA defines an irritant as a chemical which is not corrosive, but which causes a reversible inflammatory effect on living tissues by chemical action at the site of contact.

**Irritating Material** - As defined by DOT, is a liquid or solid substance which upon contact with fire or when exposed to air gives off dangerous or intensely irritating fumes (not including poisonous materials; see "Poison, Class A" and "Poison, Class B").

## — K —

**kg** - Kilogram; a metric unit of weight, about 2.2 U.S. pounds. Also see "g/kg", "g" and "mg"

## — L —

**L** - Liter; a metric unit of capacity. A U.S. quart is about 9/10 of a liter.

**LC** - Lethal Concentration; a concentration of a substance being tested that will kill a test animal. See the explanation for Section IIB of the MSDS.

**LC<sub>50</sub>** - Lethal Concentration<sub>50</sub>; the concentration of a material in air which, on the basis of laboratory tests, is expected to kill 50% of a group of test animals when administered as a single exposure (usually 1 or 4 hours). The LC<sub>50</sub> is expressed as part of material per million parts of air, by volume (ppm) for gases and vapors, or as micrograms of material per liter of air (H g/l) or milligrams of material per cubic meter of air (mg/m<sub>3</sub>) for dusts and mists, as well as for gases and vapors.

**LD** - Lethal Dose; a concentration of a substance being tested that will kill a test animal. See the explanation for Section IIB of the MSDS.

**LD<sub>50</sub>** - Lethal Dose<sub>50</sub>; a single dose of a material which on the basis of laboratory tests is expected to kill 50 percent of a group of test animals. The LD<sub>50</sub> dose is usually expressed as milligrams or grams of material per kilogram of animal body weight (mg/kg or g/kg). The material may be administered by mouth (oral) or applied to the skin (dermal or cutaneous).

**LEL, or LFL** - Lower Explosive Limit or Lower Flammable Limit of a vapor or gas; the lowest concentration (lowest percentage of the substance in air) that will produce a flash of fire when an ignition source (heat, arc, or flame) is present. At concentrations lower than the LEL the mixture is too "lean" to burn. Also see "UEL."

**Local exhaust** - A system for capturing and exhausting contaminated air at the point where the contaminants are produced (welding, grinding, sanding, or other processes or operations). Also see "general exhaust."

— M —

**M<sub>3</sub>** - cubic meter, or stere; a metric measure of volume, about 35.3 cubic feet or 1.3 cubic yard.

**Melting point** - The temperature at which a solid substance changes to a liquid state. For mixtures, the melting range may be given. Some approximate melting points:

|                       |               |                |              |
|-----------------------|---------------|----------------|--------------|
| <i>Water</i>          | <i>32° F</i>  | <i>Benzene</i> | <i>60° F</i> |
| <i>Vinyl Chloride</i> | <i>-247°F</i> | <i>Phenol</i>  | <i>118°F</i> |

**Mechanical exhaust** - A powered device, such as a motor-driven fan or air/steam venturi tube, for exhausting contaminants from a workplace, vessel, or enclosure.

**mg** - milligram; a metric unit of weight. There are 1,000 milligrams in one gram (g) of a substance. **mg/kg** - milligrams per kilogram; an expression of toxicological dose. See "g/kg." **mg/m<sup>3</sup>** - milligrams per cubic meter; a unit for measuring concentrations of dusts, gases, or mists in air.

**ml** - milliliter; a metric unit of volume, equal to one cubic centimeter (cc), or about 1/16 of a cubic inch. There are 1,000 milliliters in one liter (1). **mm Hg** - millimeters (mm) of mercury (Hg); a unit of measurement for low pressures or partial vacuums. One atmosphere (sea level, 20°C) is 760 mm Hg.

**mppcf** - million particles per cubic foot; a unit for measuring particles of a substance suspended in air. Exposure limits for mineral dusts (silica, graphite, Portland cement, nuisance dusts, and others), formerly expressed as mppcf, are now more commonly quoted in **mg/m<sub>3</sub>**.

**MSHA** - The Mine Safety and Health Administration of the U.S. Department of Labor, federal agency with safety and health regulatory and enforcement authorities for the mining industry. Also see "OSHA"

**Mutagen** - A substance or agent capable of altering the genetic material in a living cell.

## — N —

**N<sub>2</sub>** - Nitrogen; a colorless, odorless, and tasteless gas that will not burn and will not support combustion. The earth's atmosphere (air) is about 78 per cent nitrogen; at higher concentrations, nitrogen can displace oxygen and become a lethal asphyxiant. See "Asphyxiant."

**NaOH** - Sodium hydroxide, or caustic soda ("caustic"). Necrosis - Tissue death at the site of contact or injection.

**NRC** - National Response Center; a notification center in the Coast Guard Building in Washington, D.C., with a toll-free telephone number (1-800-424-8802) which must be called when significant oil or chemical spills or other environmentally-related accidents occur.

**NBUAC**, or **n-BuAC** - normal-butyl acetate. See "evaporation rate."

**NFPA** - National Fire Protection Association; an international membership organization to promote/ improve fire protection and prevention and establish safeguards against loss of life and property by fire. Best known on the industrial scene for the National Fire Codes — 16 volumes of codes, standards, recommended practices and manuals developed (and periodically updated) by NFPA technical committees.

Among these is NFPA 704, the code for showing hazards of materials AS THEY MIGHT BE ENCOUNTERED UNDER FIRE OR RELATED EMERGENCY CONDITIONS, using the familiar diamond-shaped label or placard with appropriate numbers or symbols.

**NIOSH** - National Institute for Occupational Safety and Health of the Public Health Service, U.S. Department of Health and Human Services (DHHS); federal agency which — among other activities — tests and certifies respiratory protective devices and air sampling detector tubes, recommends occupational exposure limits for various substances, and assists OSHA and MSHA in occupational safety and health investigations and research.

**NO<sub>x</sub>** - oxides of nitrogen; undesirable air pollutants. NO emissions are regulated by EPA under the Clean Air Act.

— O —

**Olfactory** - relating to the sense of smell. The olfactory organ in the nasal cavity is the sensing element that detects odors and transmits information to the brain through the olfactory nerves.

**Oral** - used in or taken into the body through the mouth.

**Oral Toxicity** - Adverse effects resulting from taking a substance into the body via the mouth. Ordinarily used to denote effects in experimental animals.

**OSHA** - Occupational Safety and Health Administration of the U.S. Department of Labor; federal agency with safety and health regulatory and enforcement authorities for most U.S. industry and business. Also see "MSHA."

**Oxidation** - In a literal sense, oxidation is a reaction in which a substance combines with oxygen provided by an oxidizer or oxidizing agent (see definitions below). In a broader sense, based on modern atomic theory, science today defines oxidation as a reaction brought about by an oxidizing agent in which atoms, molecules, or ions lose electrons. In this broader sense, an oxidation reaction may occur even when oxygen is not present. However it may be defined, an oxidation reaction is always accompanied by an offsetting (balancing) reduction reaction in which (1) oxygen is removed from a compound, or (2) atoms, molecules, or ions gain electrons.

**Oxidizer** - DOT defines an oxidizer or oxidizing material as a substance that yields oxygen readily to stimulate the combustion (oxidation) of organic matter. Compounds containing chlorate ( $\text{ClO}_3$ ), permanganate ( $\text{MnO}_4$ ) and nitrate ( $\text{NO}_3$ ) are examples of oxidizers; note that all contain oxygen (0).

**Oxidizing Agent** - A chemical or substance which brings about an oxidation reaction. The agent may (1) provide the oxygen to the substance being oxidized (in which case the agent has to be oxygen or contain oxygen), or (2) it may receive electrons being transferred from the substance undergoing oxidation (chlorine is a good oxidizing agent for electron-transfer purposes, even though it contains no oxygen).

— P —

**PEL** - Permissible Exposure Limit; an exposure limit established by OSHA regulatory authority. May be a time-weighted average (TWA) limit or a maximum concentration exposure limit. Also see "Skin."

**% Volatile** - Percent volatile by volume; the percentage of a liquid or solid (by volume) that will evaporate at an ambient temperature of 70-F (unless some other temperature is stated). Examples: butane, gasoline, and paint thinner (mineral spirits) are 100% volatile; their individual evaporation rates vary, but over a period of time each will evaporate completely. EPON solutions however, may be only 10% to 60% volatile; only the solvent evaporates, leaving the resin as a nonvolatile residue.

**pH** - a scale indicating the acidity of a solution, with 7 being neutral. A pH of less than 7 indicates acidity. A pH of greater than 7 indicates alkalinity.

**PMCC** - Pensky-Martens Closed Cup; a flashpoint test method.

**Poison, Class A** - A DOT term for extremely dangerous poisons, that is, poisonous gases or liquids of such nature that a very small amount of the gas, or vapor of the liquid, is dangerous to life. Some examples: phosgene, cyanogen, hydrocyanic acid, nitrogen peroxide.

**Poison, Class B** - A DOT term for a liquid, solid, paste, or semisolid substance — other than Class A poisons or irritating materials — which are known (or presumed on the basis of animal tests) to be so toxic to people as to afford a hazard to health during transportation.

**Polymerization** - A chemical reaction in which one or more small molecules combine to form larger molecules. A hazardous polymerization is one which takes place at a rate which releases large amounts of energy. If a hazardous polymerization can occur with a given material, the MSDS usually will list conditions which could start the reaction and, since the material usually contains a polymerization inhibitor, the expected time period before the inhibitor is used.

**ppm** - Parts per million; a unit for measuring the concentration of a gas or vapor in air — parts (by volume) of the gas or vapor in a million parts of air. Also used to indicate the concentration of a particular substance in a liquid or solid.

**ppb** - Parts per billion; a unit for measuring the concentration of a gas or vapor in air — parts (by volume) of the gas or vapor in a billion parts of air. Usually used to express measurements of extremely low concentrations of unusually toxic gases or vapors. Also used to indicate the concentration of a particular substance in a liquid or solid.

**psi** - Pounds per square inch; for MSDS purposes, a unit for measuring the pressure a material exerts on the walls of a confining vessel or enclosure. For technical accuracy, pressure must be expressed as psig (pounds per square inch gauge) or psia (pounds per square inch absolute; that is, gauge pressure plus sea level atmospheric pressure, or psig plus about 14.7 pounds per square inch). Also see “mm Hg.”

— R —

**Reaction** - A chemical transformation or change; the interaction of two or more substances to form new substances.

**Reactivity** - A description of the tendency of a substance to undergo chemical reaction with the release of energy. Undesirable effects, such as pressure buildup, temperature increase, formation of noxious, toxic, or corrosive by-products, may occur because of the reactivity of a substance to heating, burning, direct contact, with other materials, or other conditions in use or in storage. A solid waste which exhibits a “characteristic of reactivity,” as defined by RCRA, may be regulated (by EPA) as a hazardous waste.

**Reducing agent** - In a reduction reaction (which always occurs simultaneously with an oxidation reaction) the reducing agent is the chemical or substance which (1 ) combines with oxygen or (2) loses electrons in the reaction. See “Oxidation.”



**Respiratory system** - The breathing system; includes the lungs and the air passages (trachea or “windpipe,” larynx, mouth, and nose) to the air outside the body, plus the associated nervous and circulatory systems.

**RCRA**- Resource Conservation and Recovery Act; federal environment legislation administered by EPA, aimed at controlling the generation, treating, storage, transportation, and disposal of hazardous wastes.

— S —

**Sensitizer** - As defined by OSHA, a chemical that causes a substantial proportion of exposed people or animals to develop an allergic reaction in normal tissue after repeated exposure to the chemical. Skin sensitization is the most common form of sensitization in the industrial setting, although respiratory sensitization to a few chemicals is also known to occur.

**SETA** - Setaflash Closed Tester; a flashpoint test method.

**“Skin”** - A notation, sometimes used with PEL or TVL exposure data; indicates that the stated substance maybe absorbed by the skin, mucous membranes, or eyes — by direct contact or airborne exposure — and that this additional exposure must be considered part of the total exposure when comparing exposures to the PEL or TLV for that substance.

**Skin Sensitizer** - See “Sensitizer.”

**Skin Toxicity** - See “Dermal Toxicity.”

**Solubility in water** - A term expressing the percentage of a material (by weight) that will dissolve in water at ambient temperature. Solubility information can be useful in determining spill cleanup methods and fire-extinguishing agents and methods. Terms used to express solubility are:

|             |                            |
|-------------|----------------------------|
| negligible  | Less than 0.1 percent      |
| slight      | 0.1 to 1.0 percent         |
| moderate    | 1 to 10 percent            |
| appreciable | more than 10 percent       |
| complete    | soluble in all proportions |

**SO<sub>x</sub>** - Oxides of sulfur; undesirable air pollutants. SO<sub>x</sub> emissions are regulated by EPA under the Clean Air Act.

**Species** - A biological type; on MSDS species refers to the test animals —usually rats, mice, or rabbits — which were used to obtain the toxicity test data reported.

**Specific gravity** - The weight of a material compared to the weight of an equal volume of water; an expression of the density (or heaviness) of the material. Example: if a volume of a material weighs 8 pounds, and an equal volume of water weighs 10 pounds, the material has a specific gravity of 0.8:

$$\frac{8 \text{ lbs.}}{10 \text{ lbs.}} = 0.8$$

Insoluble materials with specific gravity of less than 1.0 will float in (or on) water. Insoluble materials with specific gravity greater than 1.0 will sink in water. Most (but not all) flammable liquids have specific gravity less than 1.0 and, if not soluble, will float on water — an important consideration for fire suppression.

**Stability** - An expression of the ability of a material to remain unchanged. For MSDS purposes, a material is stable if it remains in the same form under expected and reasonable conditions of storage or use. Conditions which may cause instability (dangerous change) are stated, e.g., temperatures above 150°F or shock from dropping.

**STCC #** - Standard Transportation Commodity Code; 7 digit identification number to be found on hazardous materials shipping documents and intermodal containers.

**STEL** - Short Term Exposure Limit; ACGIH terminology. See "TLV/STEL."

**Superfund** - See CERCLA

**Synonym** - Another name or names by which a material is known. Methyl alcohol, for example, is also known as methanol, or wood alcohol.

— T —

**TCC** - Tag (Tagliabue) Closed Cup; a flashpoint test method.

**Teratogen** - A substance or agent to which exposure of a pregnant female can result in malformation in the fetus.

**TLV** - Threshold Limit Value; ACGIH to defines three categories of TLV's:

**TLV/TWA:** the Time Weighted Average concentration for a normal 8-hour workday and a 40-hour work week to which nearly all persons may be exposed day after day, without adverse effects.

**TLV/STEL:** the Short-Term Exposure Limit, a 15-minute time-weighted average exposure which should not be exceeded at any time during a work day, even if the 8-hr. TWA is not exceeded (should not be longer than 15 minutes nor repeated more than four times per day, with at least 60 minutes between successive exposures at the STEL).

**TLV/C:** the Ceiling exposure limit — the concentration that should not be exceeded during any part of the working exposure. Also see "Skin" in the Glossary relative to TLV's.

**TOC** - Tag Open Cup; a flashpoint test method.

**Toxicity** - the sum of adverse effects resulting from exposure to a or liquid wastes which exhibit certain specified "characteristics of toxicity" may be regulated by EPA as hazardous wastes.

**Trade Name** - The trademark name or commercial trade name for a material.

**TSCA** - Toxic Substances Control Act; federal environmental legislation administered by EPA, for regulating the manufacture, handling, and use of materials classified as "toxic substances."

**TWA** - Time-Weighted Average exposure; the airborne concentration of a material to which a person is exposed, averaged over the total exposure time — generally the total workday (8 to 12 hours). Also see "TLV."

— U —

**UEL or UFL** - Upper Exposure Limit or Upper Flammable Limit of a vapor or gas; the highest concentration (highest percentage of the substance in air) that will produce a flash or fire when an ignition source (heat, arc, or flame) is present. At higher concentrations, the mixture is too "rich" to burn. Also see "LEL."

**UN/NA Identification Number** - United Nations or North American ID number, Department of Transportation issued, 4 digit hazardous material identification number.

**Unstable** - Tending toward decomposition or other unwanted chemical change during normal handling or storage.

**USDA** - U.S. Department of Agriculture; prior to 1971, USDA performed tests and issued approvals on respirators for use with pesticides. In 1971 the Bureau of Mines took over the respirator testing/approval functions — procedures later delegated to the Testing and Certification Branch (TCB) of NIOSH. Also see “BOM.”

— V —

**Vapor density** - The weight of a vapor or gas compared to the weight of an equal volume of air; an expression of the density of the vapor or gas. Materials lighter than 184 have vapor densities less than 1.0 (examples: acetylene, methane, hydrogen). Materials heavier than air (examples: propane, hydrogen sulfide, ethane, butane, chlorine, sulfur dioxide) have vapor densities greater than 1.0. All vapors and gases will mix with air, but the lighter materials will tend to rise and dissipate (unless confined). Heavier vapors and gases are likely to concentrate in low places — along or under floors or in sumps, sewers, manholes, trenches, and ditches — where they may create fire or health hazards.

**Vapor pressure** - The pressure exerted by a saturated vapor above its own liquid in a closed container. When quality control tests are performed on products the test temperature is usually 100° F, and the vapor pressure is expressed as pounds per square inch (psig or psia). Vapor pressures reported on MSDS are in millimeters of mercury (mm Hg) at 68°F (20°C), unless stated otherwise. Three facts are important to remember:

1. Vapor pressure of a substance at 100° F, will always be higher than the vapor pressure of the substance at 68°F (20°C).
2. Vapor pressures reported on MSDS in mm Hg are usually very low pressures; 760 mm Hg is equivalent to 14.7 pounds per square inch.
3. The lower the boiling point of a substance, the higher its vapor pressure.

**Ventilation** - See “General Exhaust,” “Local Exhaust,” and “Mechanical Ventilation.”

# Appendix E

## Incident Command Worksheet

**HAZARDOUS MATERIALS ON-SCENE  
INCIDENT COMMANDER**

|                                                                                                                                                                                                                                                             |                                |                          |                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------------------------|------------------------|
| <b>INCIDENT OBJECTIVES</b>                                                                                                                                                                                                                                  | 1. Incident Name               | 2. Date                  | 3. Time                |
| 4. Operational Period                                                                                                                                                                                                                                       |                                |                          |                        |
| 5. General Control Objectives for the Incident (include alternatives)<br><div style="display: flex;"> <div style="flex: 1; padding-right: 10px;">Management Objectives</div> <div style="flex: 1; padding-right: 10px;">Operational Objectives</div> </div> |                                |                          |                        |
| 6. Weather Forecast for Period                                                                                                                                                                                                                              |                                |                          |                        |
| 7. General Safety Message                                                                                                                                                                                                                                   |                                |                          |                        |
| 8. Attachments (mark if attached)                                                                                                                                                                                                                           |                                |                          |                        |
| <input type="checkbox"/>                                                                                                                                                                                                                                    | Organization List - ICS 203    | <input type="checkbox"/> | Medical Plan - ICS 206 |
| <input type="checkbox"/>                                                                                                                                                                                                                                    | Div. Assignment List - ICS 204 | <input type="checkbox"/> | Incident Map           |
| <input type="checkbox"/>                                                                                                                                                                                                                                    | Communications Plan - ICS 205  | <input type="checkbox"/> | Traffic Plan - ICS 203 |
|                                                                                                                                                                                                                                                             |                                | <input type="checkbox"/> | Other                  |